ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

SEPTEMBER 1954

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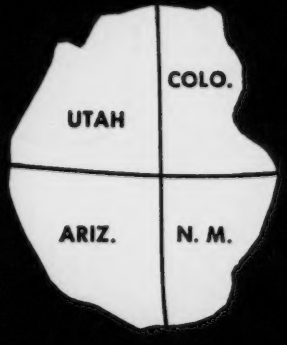
FOUNDED 1866

U_3O_8

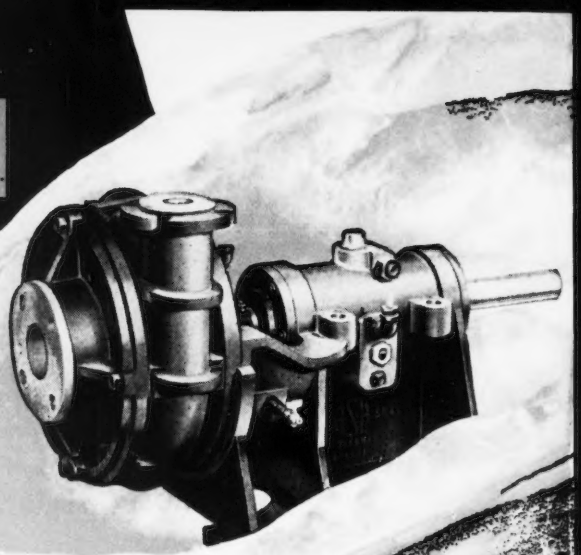
Formula For Profits



FLASH===FOOD AND FUN IN SAN FRANCISCO P.119===AMC SHOW DIRECTORY P.124==

The Hydroseal

IN A NUT SHELL



Your meat:

Reduce power costs 1/3 to 1/2
— never need over-size pump & motor as allowance for wear

Achieve maximum head

Install for suction lift

Operate with extreme inlet pressure

Work in series

Compensate for changes in volume and head by automatic speed control

Chief reasons:

By protecting close clearances from abrasives, a flow of seal liquid enables Hydroseals to maintain initial high efficiency throughout pump life.

For pumping slurry and sand up to 1/4" mesh, the parts exposed to wear are made of easily-replaced Maximix Rubber, which outlasts metal 4 to 6 times. For pumping larger abrasives, these parts in Hydroseal Dredge Pumps are made of specially resistant alloys.

You are invited to
Booth 1015
AMC Mining Show
San Francisco
Sept. 20-23

Write for Hydroseal Catalog No. 953

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives throughout the World

HYDROSEAL and CENTRISEAL
SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

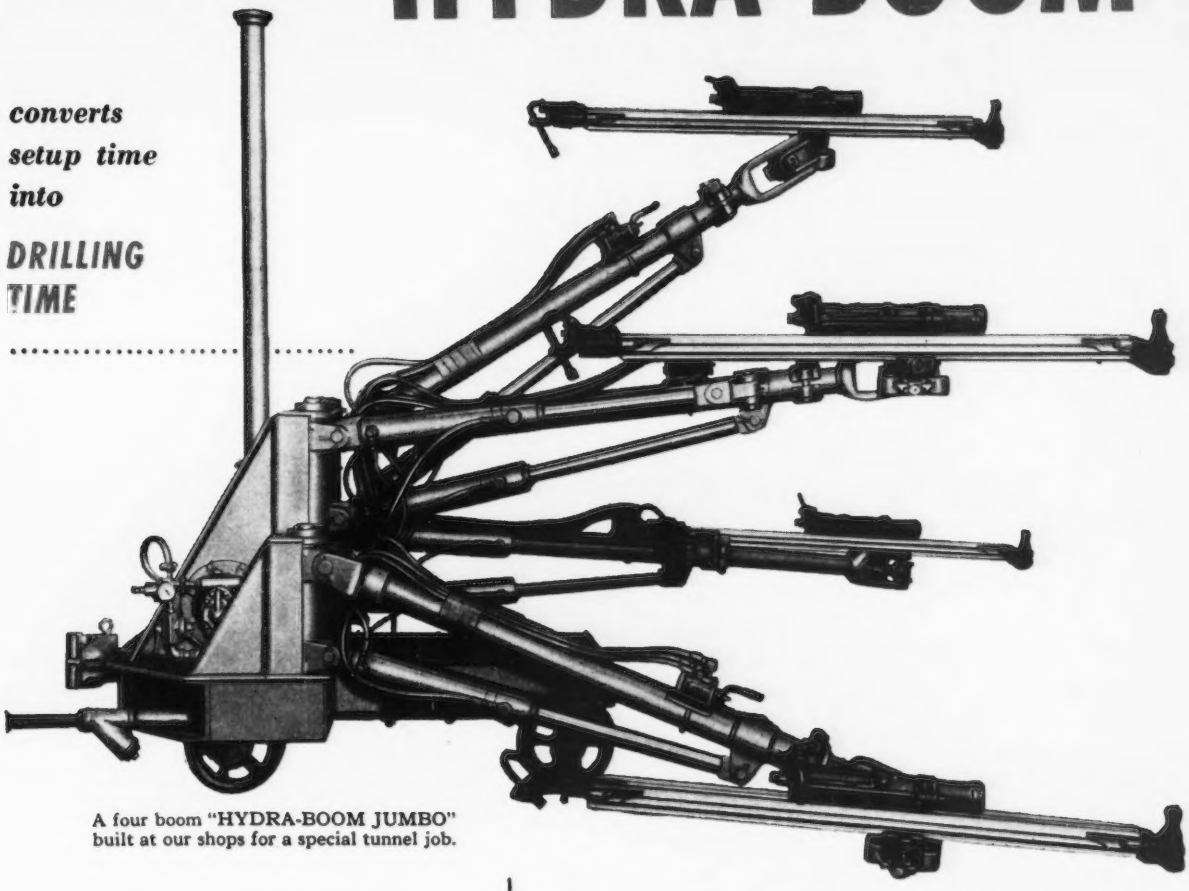
A more powerful, faster-acting, boom jumbo

INGERSOLL-RAND HYDRAULICALLY-OPERATED

THE NEW HYDRA-BOOM

converts setup time into

DRILLING TIME



A four boom "HYDRA-BOOM JUMBO" built at our shops for a special tunnel job.

Only HYDRA-BOOM has these advanced design features

1. LARGER PISTON ARM CYLINDERS for lower oil pressure and longer packing life. They will handle longer and heavier drill feeds.

2. DOUBLE ACTING HYDRAULIC CYLINDERS permit mounting under deck as well as top side because boom operation is not dependent on gravity.

3. EXTRA LONG PISTON ARMS give unmatched stability.

4. LOWER OVERALL HEIGHT for lower headroom clearance.

Four new design features plus individual built-in oil reservoirs make the HYDRA-BOOM the outstanding hydraulically operated drill mounting of today. All HYDRA-BOOM movements, including the ceiling jack, are controlled by an air motor driven hydraulic pump – no hand pumping is ever necessary. And in addition, the hydraulic system is kept under constant pressure to insure instant and positive control at all times.

Simplicity of design, low height and built in hydraulic oil reservoirs permit the mounting of one or more HYDRA-BOOMS on practically any kind of Jumbo that may be required. A two-boom car mounted HYDRA-BOOM Jumbo is standard but let us quote you on special rigs to suit your individual requirements. Optional extendable hydraulic booms are available for use on jobs that require greater face coverage.

The new I-R HYDRA-BOOM may mean important savings for you so be sure to get the complete story from your I-R representatives without delay.

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ENGINEERING AND MINING JOURNAL

88th YEAR OF PUBLICATION

VOL. 155 No. 9

SEPTEMBER 1954

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LETTERS

No Sooner Said . . . . .

SIR:

Corking good summary of Manitouwadge prospects in (July 1954, *E&MJ*, p 116). Excellent descriptions and overall judgments. I hope you will have more such articles on Canada's interesting developments . . . also more on our Four States uranium rush.

P. B. McDONALD
New York 53, N.Y.

Ed: Seldom do we get a chance to answer a reader's request so completely and promptly. Turn to p 87, Mr. McDonald, it's all there.

Nicaro Moisture Content

SIR:

I have just read your article on Nicaro (June 1954, p 72). . . . I think you are to be commended for covering all the aspects so well in the relatively short space available. The only point I noted that you did not cover was the moisture content of the ore. . . . 4000 dry tons per day really means 5700 wet tons at 30% moisture. When one compares mining costs at Nicaro with other open pit operations, the comparison should be made on a wet ton basis.

RICHARD V. COLLIGAN
Assistant to the President
Nicaro Nickel Co.
Havana, Cuba

California Tin Reefs?

SIR:

In your March issue (*E&MJ*, This Month in Mining, p 186) you mention the work on an Australian tin reef. (Could you tell me) the width and extent of this reef? . . . percent of tin?

Here in southern California are "reefs" of low grade tin, as much as 100 ft wide and a mile or more long. A knowledge of the Australian deposits might encourage . . . exploitation of our deposits.

E. R. TAYLOR
Wildomar, Calif.

Ed: Answering Mr. Taylor's inquiry, our Australian correspondent reports: Formations of tin occur mostly in shoots of varying width, length and richness of tin. As an average it could be said that they are about 50 ft long and 14 ft wide, but many are so close together that they can be described as one field.

The assays have proved values of between 2- and 4% tin oxide. A recent discovery was assayed at 3⅜%. There were reports of some assays in excess of 4% tin oxide and some below 2%, but it is felt that the recent one of 3⅜ is quite representative.

"Whistling In The Dark"

SIR:

Bully for you on your "Uncle Sam Does it Again" (Editorial, July 1954 p

(*Continued on p 138*)

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Photo courtesy J. Robert Bazley, Inc., Pottsville, Pa.

Hose gulps a lake to rescue a coal mine

A typical example of B. F. Goodrich improvement in rubber

BENEATH this lake are coal mines that can be worked again if they can be reached. Drop some pipe in, and pump the 12-billion-gallon lake dry? The water is loaded with acid that eats steel. Use rubber hose? The water is full of silt and stones that tear rubber to shreds.

Ordinary rubber, that is. Luckily, the engineer in charge knew about a special B. F. Goodrich rubber developed for chute linings to stand the grinding of gravel and sand. This rubber is soft enough to *give* under the beating it gets, yet so tough that it's even used in some places to carry broken glass.

B. F. Goodrich hose, lined with this special rubber, has been on this job 18 months and is still good as new. It gulps 14 million gallons of water-acid-mud-small stones a day, yet engineers predict it will last the 3 years needed to finish one of the biggest draining jobs in history.

Reducing costs for business is our business. And the way we do it is by constantly improving all kinds of rubber products to make them last longer, stand harder use.

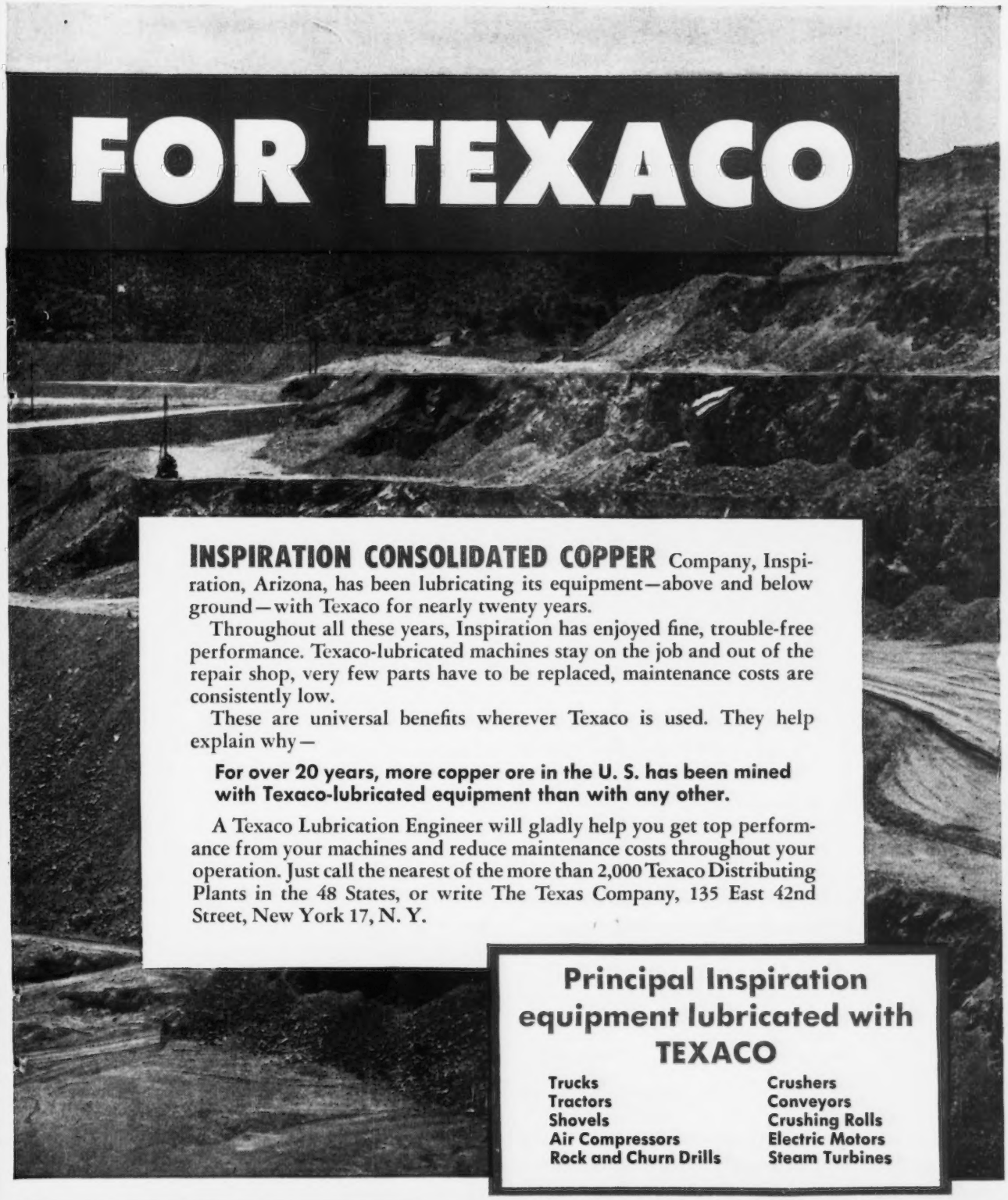
That's why the original cost of a rubber product doesn't tell the whole story. It stands to reason that B. F. Goodrich V belts that outlast others 2 and even 3 times, and conveyor belts that often last 10 times longer, will cost you far less over a period of years. To find out about recent money-saving improvements made by B. F. Goodrich and what they can do for you, call your BFG distributor or write *The B. F. Goodrich Company, Department M-299, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

INSPIRATION

TEXACO

TEXACO



FOR TEXACO

INSPIRATION CONSOLIDATED COPPER Company, Inspiration, Arizona, has been lubricating its equipment—above and below ground—with Texaco for nearly twenty years.

Throughout all these years, Inspiration has enjoyed fine, trouble-free performance. Texaco-lubricated machines stay on the job and out of the repair shop, very few parts have to be replaced, maintenance costs are consistently low.

These are universal benefits wherever Texaco is used. They help explain why—

For over 20 years, more copper ore in the U. S. has been mined with Texaco-lubricated equipment than with any other.

A Texaco Lubrication Engineer will gladly help you get top performance from your machines and reduce maintenance costs throughout your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

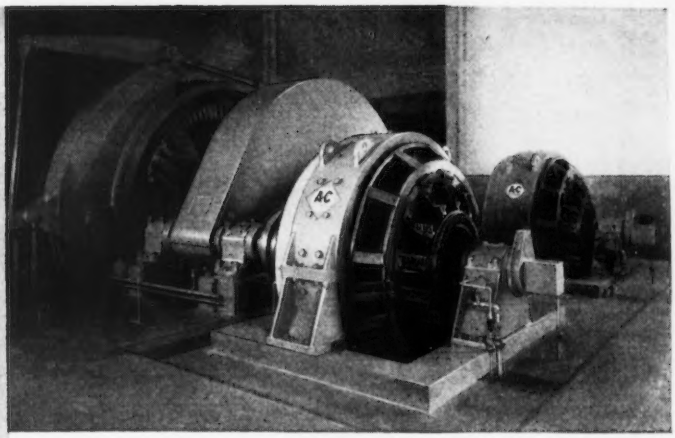
Principal Inspiration equipment lubricated with TEXACO

Trucks	Crushers
Tractors	Conveyors
Shovels	Crushing Rolls
Air Compressors	Electric Motors
Rock and Churn Drills	Steam Turbines

Lubricants and Fuels

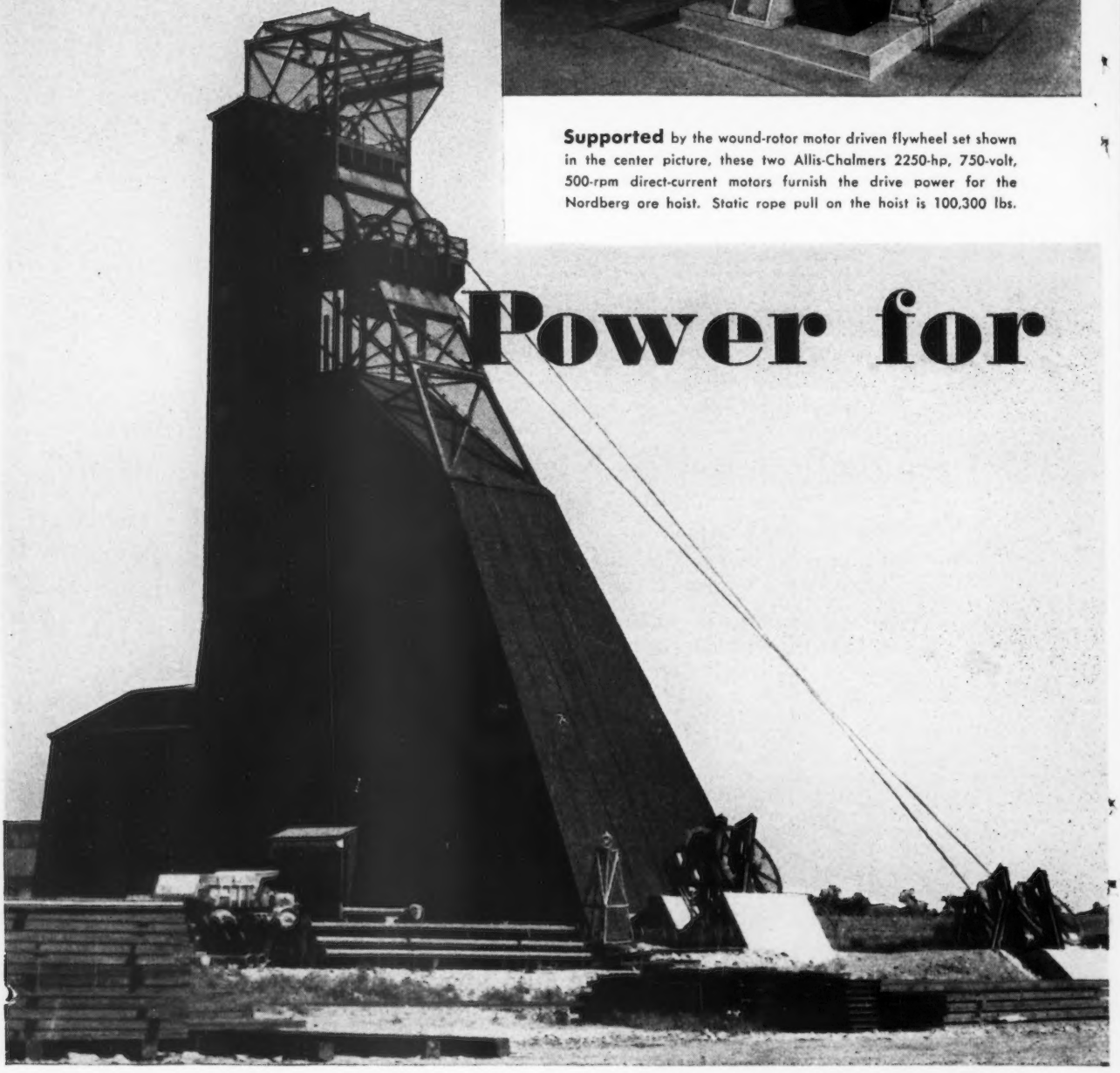
FOR THE MINING INDUSTRY

Allis-Chalmers electrical equipment for heaviest rope pull ore hoist in the country:



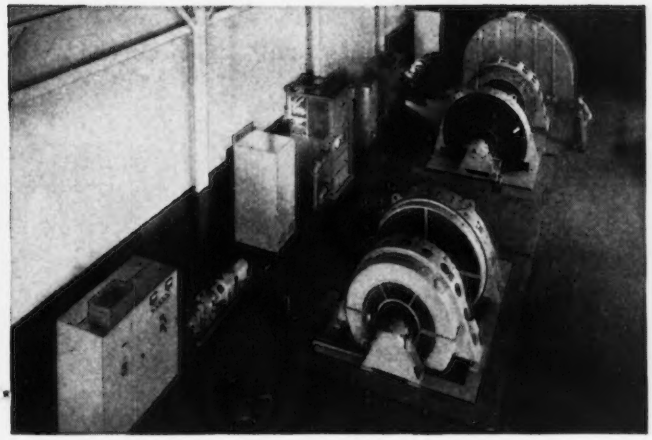
Supported by the wound-rotor motor driven flywheel set shown in the center picture, these two Allis-Chalmers 2250-hp, 750-volt, 500-rpm direct-current motors furnish the drive power for the Nordberg ore hoist. Static rope pull on the hoist is 100,300 lbs.

Power for

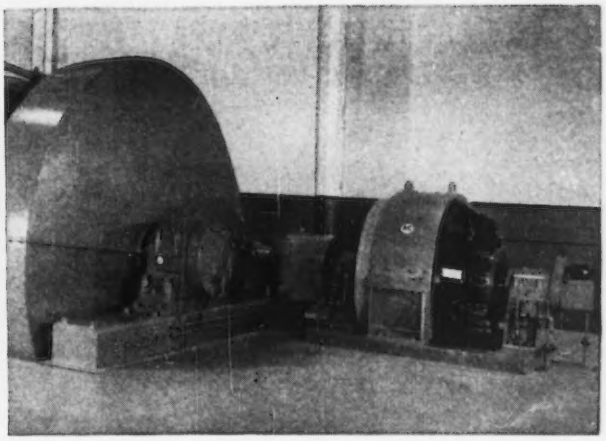


Regulex is an Allis-Chalmers trademark.

ALLIS-



Section of hoist house. The 1500-kw synchronous m-g set in foreground supports man hoist motor; 3500-kw flywheel set in background supports ore hoist motors. Controls, including Regulex exciter sets and liquid slip rheostat, are arranged along the side wall.



Drive power for the 12-ft double-drum man hoist is supplied by this 1750-hp, 750-volt, 500-rpm direct-current motor. The 94-inch face hoist lifts at a rate of 2000 ft per minute from the projected 5350-ft depth. Total static rope pull is 62,500 lbs.

the Long Haul

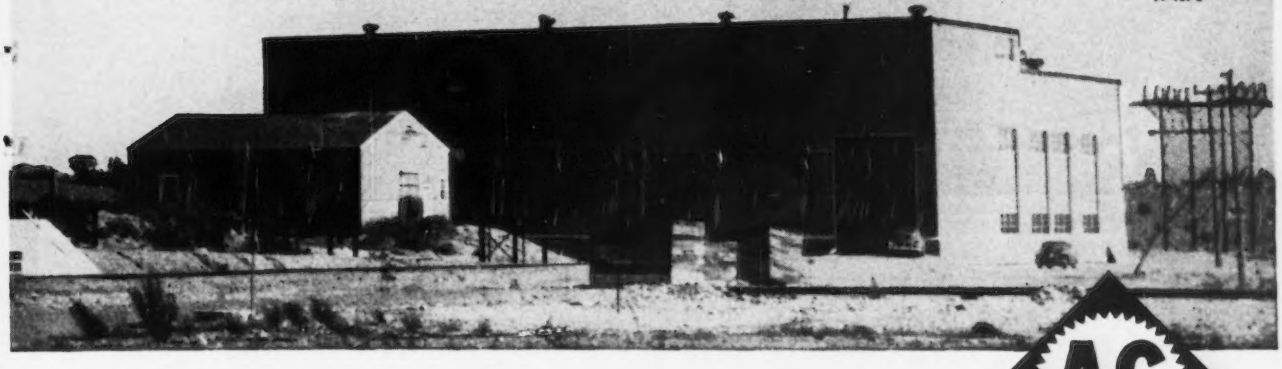
An iron mine over a mile in ultimate depth with a rope pull of 100,300 lbs is one of the projects on which millions of dollars are being spent in Upper Michigan to develop a new reserve of hematite ore for the iron and steel industry. Mining operations are expected to reach 2,000,000 tons of good grade ore per year.

Two 2250-hp dc motors and a 3500-kw supporting m-g set were supplied by Allis-Chalmers to provide the power for a 15-ft diameter, 98-inch face, double-drum ore hoist with two skips in balance. Each skip weighs 18,000 lbs and carries a load of 15 long tons, or 33,600 lbs per trip ... at a rate of 2400 ft per minute from any level.

Allis-Chalmers also furnished this installation with controls, motor and supporting m-g set for a double-drum man hoist. Operating two cages over a mile deep, this hoist carries material loads up to 20,000 lbs, and man loads to 10,000 lbs at a speed of 2000 ft per minute.

Profit by the years of Allis-Chalmers experience in the mining and ore processing field. For further information contact the A-C office nearest you, or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

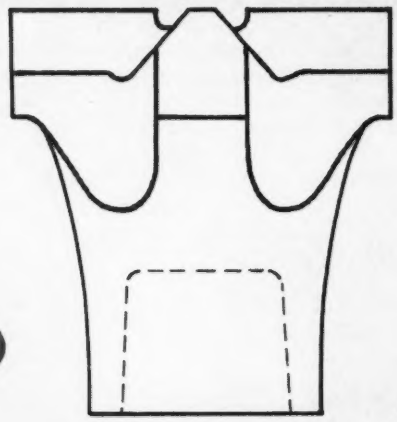
A-4378

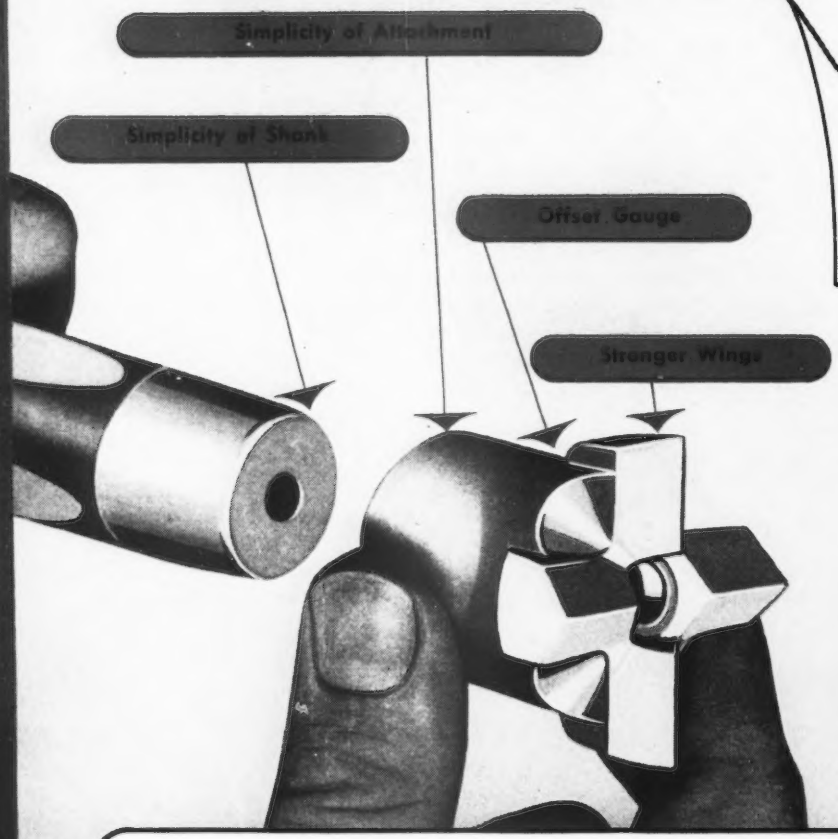


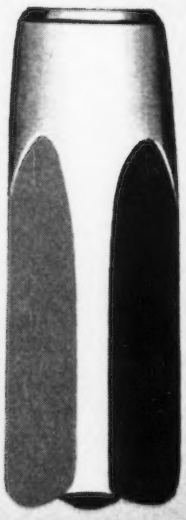
CHALMERS

A-C ALLIS-CHALMERS

Here's another







The union of the bit and the rod after drilling has a cohesive strength of several tons . . . A sharp blow of sufficient weight on the end of the bit skirt will serve to detach the bit from the rod.

SPECIFICATIONS

Mines everywhere cut drilling costs with CRD DETACHABLE DRILL BITS • 4 - Wing Type - Center Hole - Side Hole

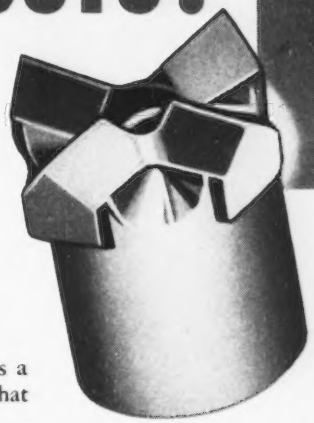
Class "A" Bits For class "A" drill steel connection on any steel. Best suited to ⅞" steel.	1-1/4	Aluminum
	1-5/16	Pink
	1-3/8	Deep Green
	1-7/16	Brown
	1-1/2	Grey
	1-9/16	Maroon
	1-5/8	Deep Blue

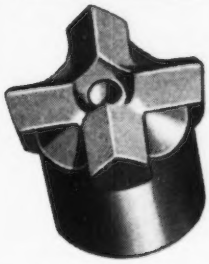
Class "B" Bits For class "B" drill steel connection on any steel. Best suited to 1", 1⅛" and 1-¼" steel.	1-7/16	Orange
	1-1/2	Green
	1-9/16	Yellow
	1-5/8	White
	1-11/16	Black
	1-3/4	Red
	1-13/16	Blue
	1-7/8	Tan
	1-15/16	Plain
	2	Pink
	2-1/8	Maroon
	2-1/4	Aluminum

Cans are labeled showing size of steel socket, gauge of bit, and color.

way to cut drilling costs!

Use Le Roi-CLEVELAND one-use CRD Detachable Bits





Lower cost per foot of hole — that's the goal of everyone who has rock to drill. And that was the goal of Le Roi-CLEVELAND engineers, too. They didn't fool around with the problem either. Fifty years of experience in designing rock drills was put to work. The result — a one-use detachable bit that can save you money in a wide variety of applications.

This designing job wasn't done overnight. You can't produce the results our engineers were after in such a short time. Instead, these bits were put to work—and, for a number of years they have helped reduce drilling costs materially in mines, in quarries, and on construction jobs.

That's why we offer them to you now — with complete confidence in their ability to help you improve your rock-drilling cost picture.

These Features Mean Lower Drilling Costs for You

Faster Drilling Speed — Special offset gauge feature, which permits the use of thinner wings and a steeper reaming angle, greatly reduces binding and provides ample clearance for cuttings. Result is a free, fast-cutting chiseling action that gives you greater drilling speed.

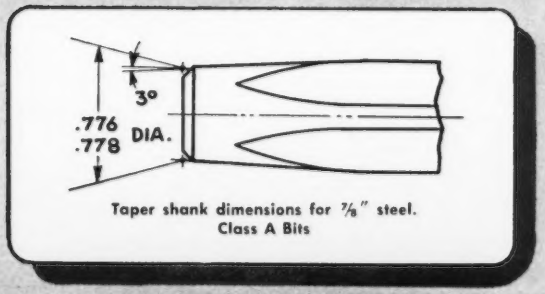
Less Drill-Steel Breakage — The method of attachment used with the CRD bit eliminates threads on the drill rod. Since a drill rod is only as strong as the root diameters of its threads, the tapered threadless CRD design provides longer drill-steel life — reduces drill-steel handling and reconditioning costs.

Lower Rock Drill Repair Costs — Because the CRD bit design reduces binding in the hole, there is less strain on the rotation parts of your rock drills. Rifle bars, rifle nuts, and chucks last longer. You get more drilling done at lower cost.

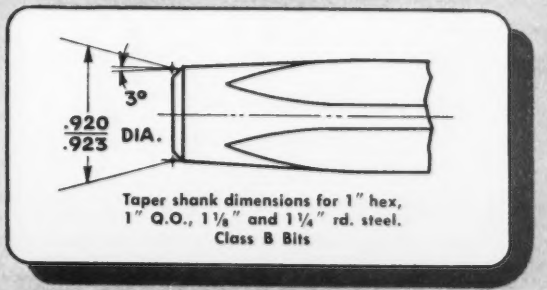
Since no special equipment is needed to thread rods, you owe it to yourself to try a can of CRD bits. They're ideal for roof bolting and for use in your stopes as well as in your headings. A short trial will give you first hand information on the ability of these bits to cut drilling costs in your property as they have in so many others.

Bulletin RD-29 gives detailed information. A copy is yours for the asking — just write for it. RD-58

CLEVELAND ROCK DRILL DIVISION
Le Roi Company
A Subsidiary of Westinghouse Air Brake Co.
12500 BEREA ROAD • CLEVELAND 11, OHIO
Plants: Milwaukee, Wis. • Cleveland — Greenwich — Dunkirk, Ohio • Coldwater, Mich.



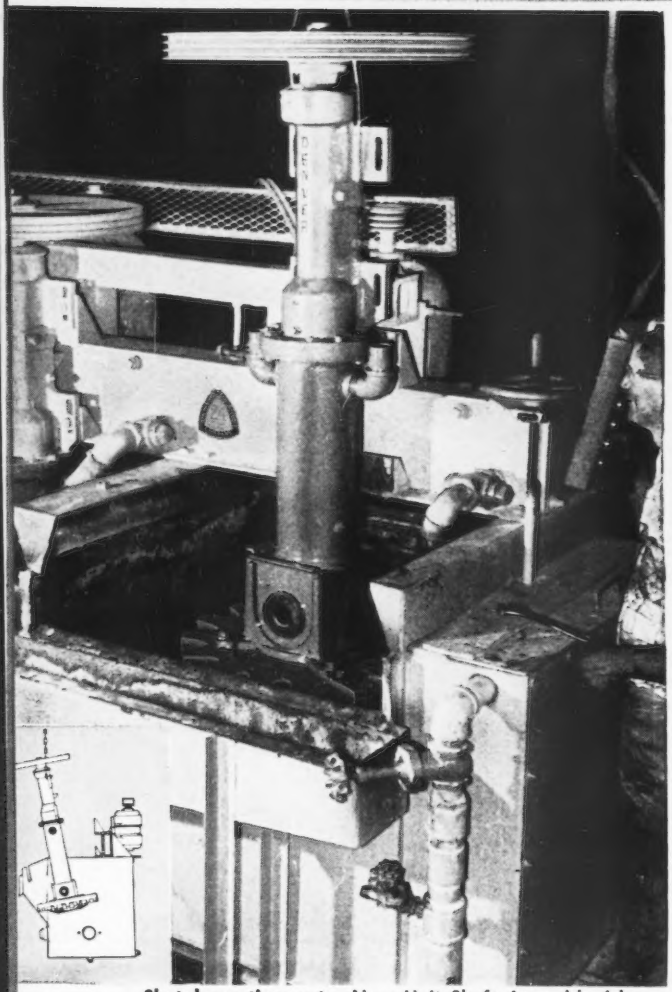
Taper shank dimensions for ⅞" steel.
Class A Bits



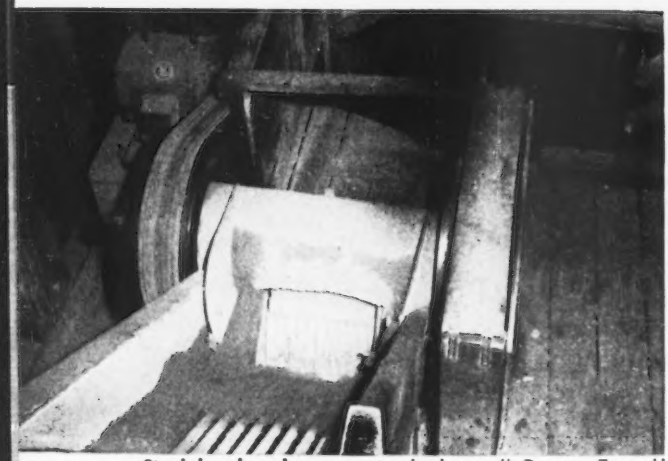
Taper shank dimensions for 1" hex, 1" O.D., 1⅛" and 1¼" rd. steel.
Class B Bits

The taper attachment shank used with the CRD bit is easy to make. You need no dies or other expensive threading equipment. Several simple, low-cost methods can be used for preparation — grinding, forging or machining.

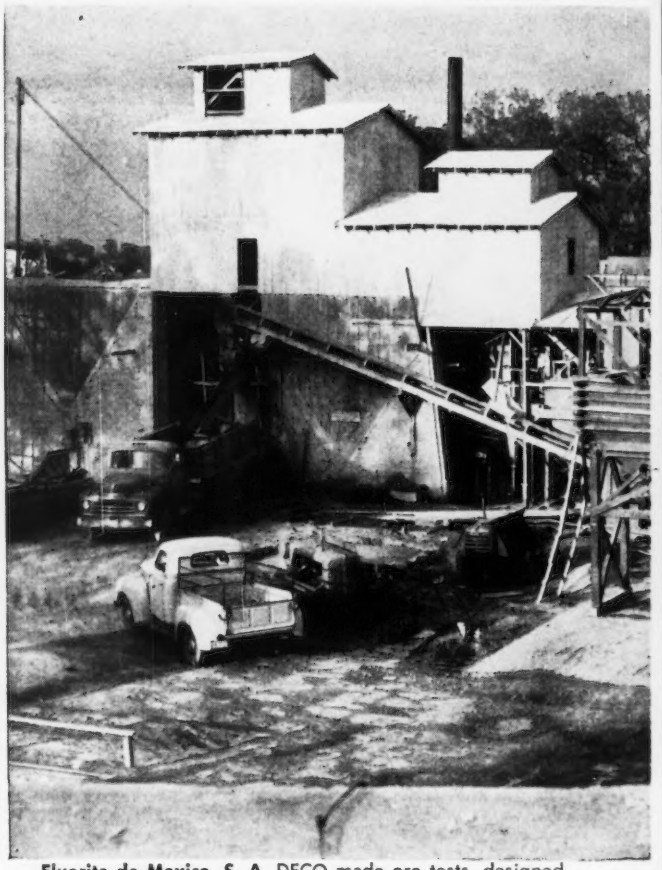
DENVER EQUIPMENT



Shut-down time cut — New Unit Shaft Assembly (above, being lifted out) on Denver "Sub-A" Flotation Machine cuts down-time to 10 minutes when replacing wearing parts. Only four easy-to-reach bolts on upper spindle bearing to remove and unit can be easily pulled out. It is applicable to all older machines because of DECO's standardization and policy of "no yearly models, but constant improving." Simplicity and standardization is our goal. Item No. 301.



Steel hood and apron, standard on all Denver Type H Crushers, protects heavy anti-friction bumper bearings. Denver Jaw Crushers to 32"x40" available for quick delivery. Item No. 303.



Fluorita de Mexico, S. A. DECO made ore tests, designed flowsheet, made preliminary mill drawings and supplied equipment for this new fluorspar mill. DECO engineers are

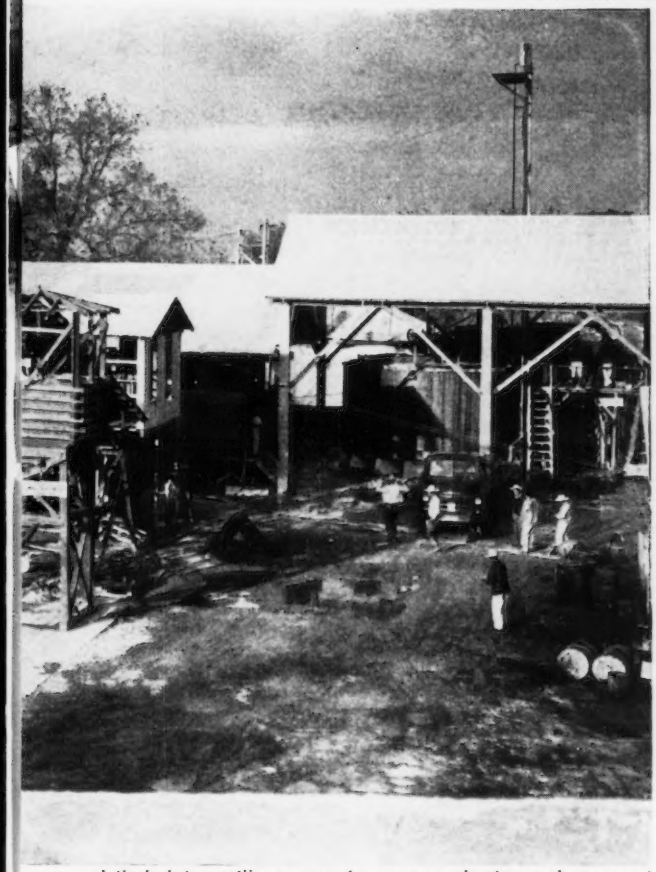
Thickener eliminated by 1½" Denver Vertical Pump's ability to handle frothy zinc concentrates without excessive spray water. Item No. 304.

Mr. Clarence Thom, Director of Denver Ore Testing Division: "We have helped operators around the world increase profits by checking mill results. May we help you?" Item No. 306.

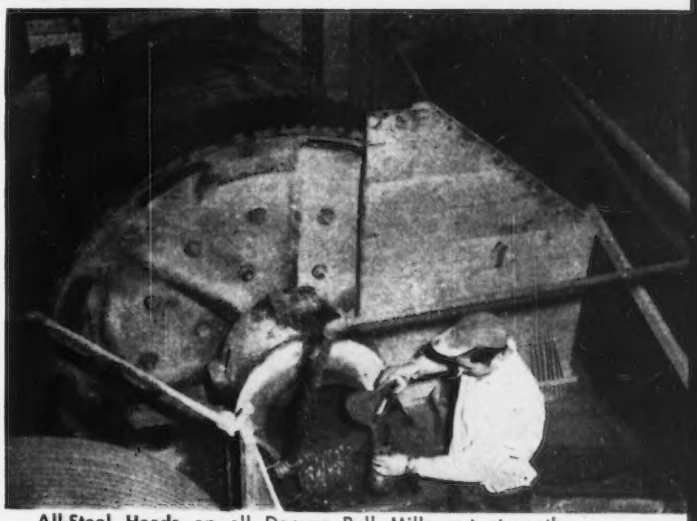
"The firm that makes its friends happier, healthier and wealthier"

DENVER EQUIPMENT CO. 1400 17th St., Denver 17, Colorado

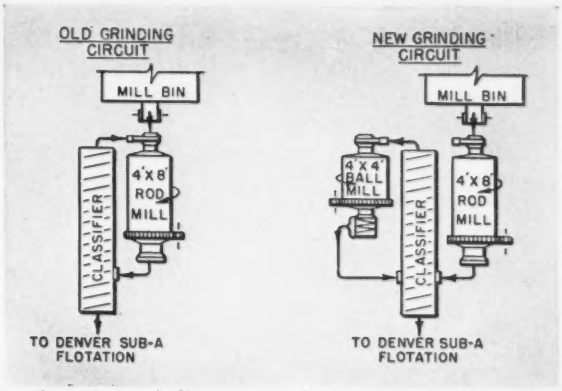
IN THE NEWS . . .



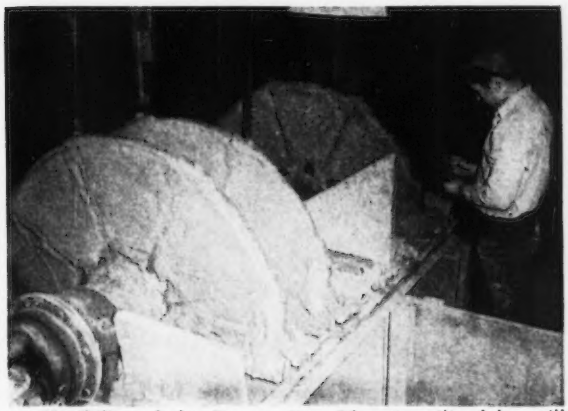
daily helping mill operators increase production and recovery! Let us help you on your next flowsheet change. Write for the complete Fluorita story. Item No. 310.



All-Steel Heads on all Denver Ball Mills put strength where it's needed. Item No. 308.

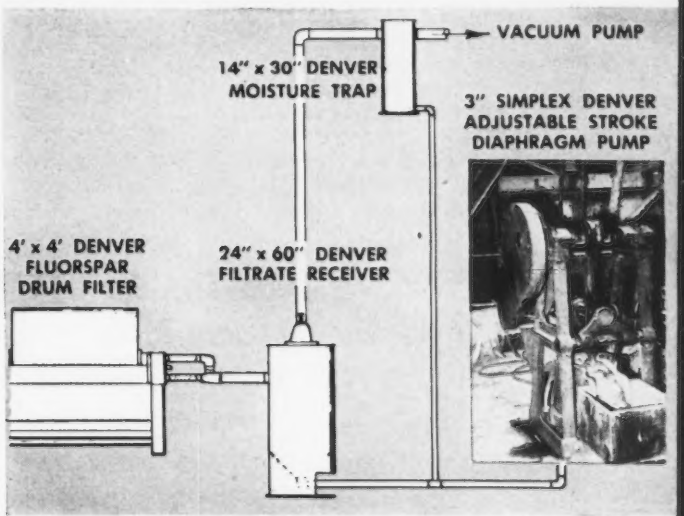


Two-stage grinding increased tonnage from 105 to 135 T/24 hrs. New DECO Flowsheet Study compares cost, H.P., savings, etc. on one- and two-stage systems. Item No. 302.



Flexibility of the Denver Disc Filter is utilized by mill operator to filter zinc on two discs and lead on one disc. Item No. 307.

New handy reference on Denver Tanks has just been published. This Denver Tank Bulletin includes specifications, price estimates, applications, and erection data. Item No. 305.


VACUUM PUMP
14" x 30" DENVER MOISTURE TRAP
3" SIMPLEX DENVER ADJUSTABLE STROKE DIAPHRAGM PUMP
4' x 4' DENVER FLUORSPAR DRUM FILTER
24" x 60" DENVER FILTRATE RECEIVER

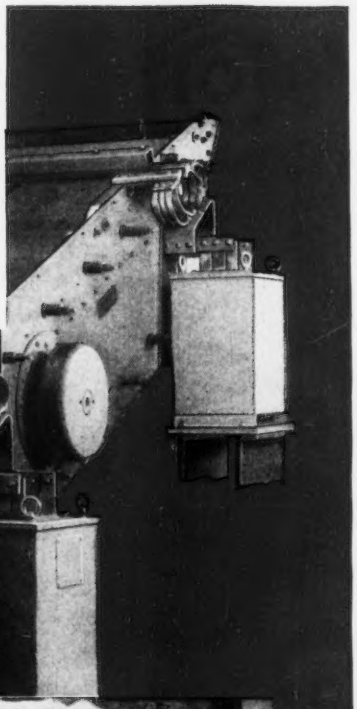
Denver Adjustable Stroke Diaphragm Pumps, as filtrate pumps, eliminate air-locking and excessive pump wear due to dirty filtrates. Stroke and volume can be adjusted while pump operates. Item No. 309.

WRITE TODAY, FOR ADDITIONAL INFORMATION . . . Please request additional information by the Item Number.

COLORADO SPRINGS, 500 South Sawatch Street, Phone MElrose 3-7158
DENVER 17, Box 5268, 1400 17th Street Cable DECO, Phone CHerry 4-4466.
CHICAGO 1, Bell Building, CEntral 6-2423.
NEW YORK, Empire State Bldg., Cable DECOYORK, Phone Chickering 4-6510.
EL PASO, 201 West 7th Street, Phone 3-8371.
SALT LAKE CITY, P. O. Box 705, Phone 84-8012.
TORONTO, ONT., 220 Bay Street, Cable DECOTOR, Phone EMpire 3-8836.
VANCOUVER, B. C., Credit Foncier Building, Phone Marine 4918.
LONDON, EC2, 15/17 Christopher St., Finsbury Square, Cable DECOLON, Phone Bishopsgate 3575.
MEXICO, D.F., Avenida Juarez 14, Phone 21-1477.
JOHANNESBURG, Broadway & 9th, Bez Valley, Cable DECOJO, Ph. 25-7531

Stops Blinding

Increases Capacity — Cuts Screening Costs



THERMO-DECK Heating Unit

POWER ON. *Thermo-Deck* heating unit keeps screen cloth clear on vibrating screen handling fine, moist material.

POWER OFF. Troublesome blinding occurs. This view shows same screen as above, with *Thermo-Deck* unit shut off.

You can screen fine, moist material *continuously* with a *Thermo-Deck* heating unit. No down time required to clear fine or medium mesh screen cloth!

Heated screen cloth remains open . . . you get *more* tonnage through the screen and better separation.

Operating records prove that heated wire cloth screens last up to three times longer than non-heated cloth, because they do not have to be pounded free of blinded material. For the same reason, you save man-hours too. These lower costs increase your profits.

The *Thermo-Deck* unit can be applied to Allis-Chalmers screens in the field. See your nearby Allis-Chalmers representative for complete details. Or write Allis-Chalmers, Milwaukee 1, Wis., for Bulletin 07B7812.

Visit the
ALLIS-CHALMERS EXHIBIT
at the American Metal Mining Exposition
San Francisco Civic Auditorium
September 20-23

BOOTHS
125-
135-
141

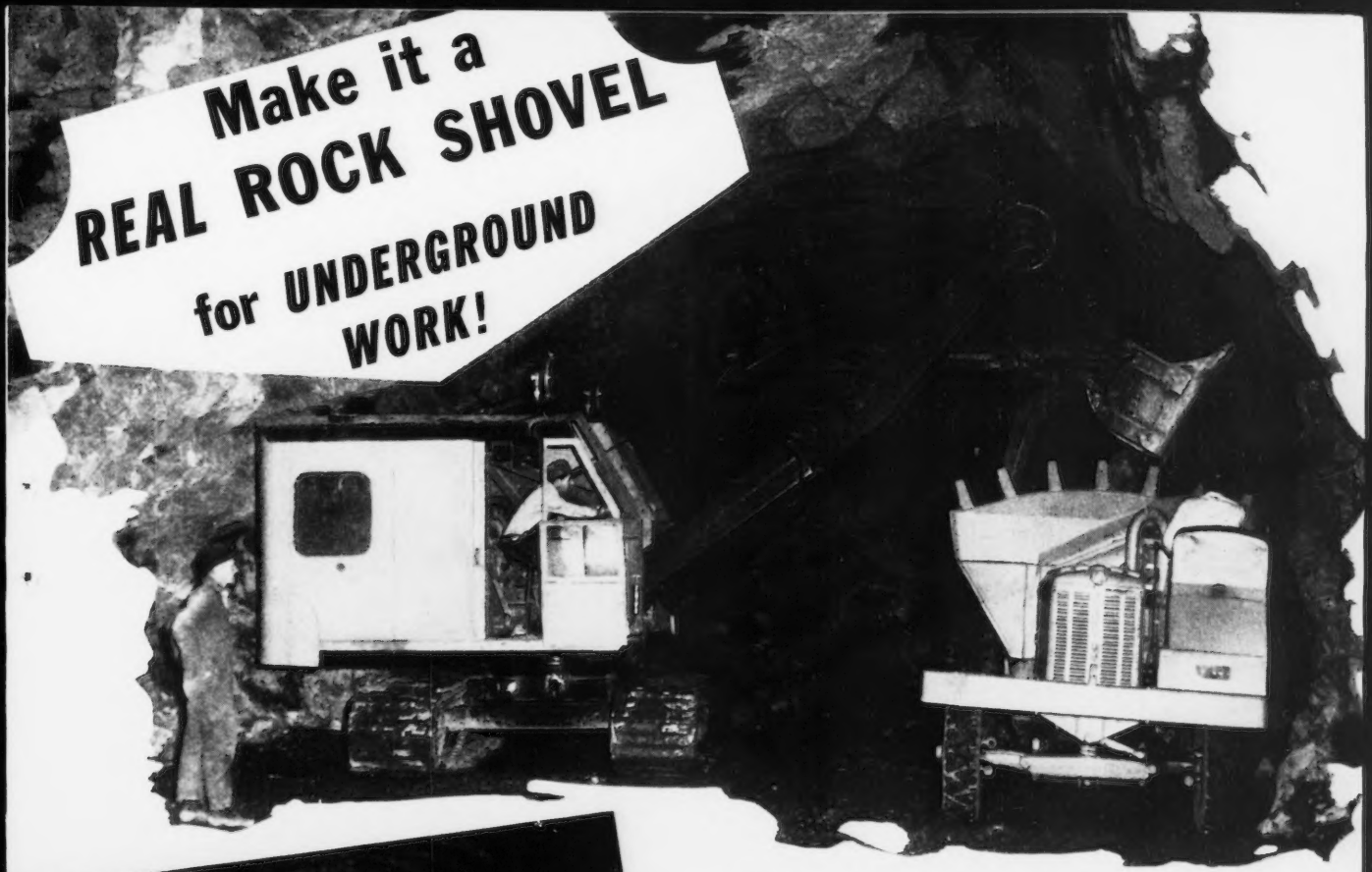
ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-1474

Thermo-Deck and Tu-Flow are Allis-Chalmers Trademarks.

Make it a REAL ROCK SHOVEL for UNDERGROUND WORK!



NORTHWEST ADVANTAGES will mean even more underground, where smoothness and accuracy of handling takes on greater importance than on the surface.

On jobs like these the "Feather-Touch" Clutch Control frees you from the complications of delicate pumps and compressors which often require special knowledge for adjustment. Uniform Pressure Swing Clutches eliminate the jerks and grabs that delay spotting the load and reduce output. The Northwest Dual Independent Crowd utilizes force most independent crowd shovels waste. It's a clean cut into the bank — no stutter — no restarts — no dipper juggling! Simplicity of design makes upkeep easy in underground conditions which may often be tough and Northwest steering gives easier maneuvering in the close quarters of tunnel work.

These are just a few of the Northwest features that have proved a Northwest to be a *real hard* Rock Shovel underground as well as in surface pits. Ask for more details. There is a Northwest Man near you.

NORTHWEST ENGINEERING COMPANY
1509 Field Building, 135 South La Salle Street, Chicago 3, Illinois

DIESEL or ELECTRIC

Has Your Shovel Stood the ROCK TEST

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

THIS IS IT!

your hospitality center at the show . . .

CF&I
REST & SERVICE CENTER
THAT'S FOR ME!
ME, TOO!!
I NEVER CAN GET A 'PHONE AT THESE CONVEN-TIONS!
C'MON OVER TO THE CF&I BOOTH, GEORGE. THEY'VE GOT A SWELL 'PHONE SERVICE THERE!
TELEPHON
BOY!— MY FEET ARE KILLING ME!!
AM I GLAD SOMEBODY SUPPLIED SOME CHAIRS!
CF&I TELEPHONE SERVICE
IS THAT A MIRAGE, OR DO I SEE A WATER COOLER?
CAN I GET A LETTER WRITTEN HERE?
OF COURSE!— THAT'S PART OF CF&I CONVENTION SERVICE,— AND WE EVEN INCLUDE THE POSTAGE!
IT'S WATER, BROTHER! CF&I THINKS OF EVERYTHING!
THIS BOOTH IS A GOOD PLACE TO MEET! YOU CAN LOOK AT THE CF&I DISPLAYS IF YOU HAVE TO WAIT
WATER!

Yes, CF&I's exhibition booth will be fully equipped as a hospitality center at the Mining Show in San Francisco. There'll be everything you need to make your stay comfortable and successful. Whether you want ice water, a place to sit down and relax, telephone service, or even secretarial assistance, you'll be able to get it at CF&I's hospitality center—Booths 1110, 1112, 1114, 1116.

THE COLORADO FUEL AND IRON CORPORATION

DENVER • OAKLAND • NEW YORK

CF&I

2610

MOVING A MILLION YARDS A MONTH

GETS JUMP ON KANSAS' TRICKIEST RIVER!

THE KIRWIN DAM, now heading for completion 13 months ahead of schedule, is not our nation's largest—but the Solomon River, which it harnesses at last, could well be America's most fiendishly treacherous dam site! But neither dust nor deluge, seepage nor high winds nor low visibility—nor 15,000-yard landslides (as shown above)—can keep these steeped-in-experience, veteran contractors from hitting their breakneck dirt-moving pace of more than a million yards a month!

Trained experts periodically examine giant tires that keep over 100 pieces of equipment rolling double shifts.

Goodyear was there with precisely the *right* tires to take on the roughest jobs — and live to tell the tale of *savings* in time and equipment!

You too will find Goodyear "there" — with tires more enduring than ever—for they're made with Goodyear's new, Triple-Tempered (3-T) cord.

This exclusive patented 3-T process keeps Nylon or Rayon cord at its most bruise-resistant, heat-resistant point. It controls tire growth, reduces cracking, tread and body failures to new LOWS, keeps tires in shape for re-lugs and recaps. Remember, only Goodyear can give you 3-T Nylon or Rayon. Remember it next time you specify *any* type tire!

Goodyear, Truck Tire Department, Akron 16, Ohio

HARD ROCK LUG

HARD ROCK RIB

ALL-WEATHER

SURE-GRIP

Sure-Grip, All-Weather—T. M.'s
The Goodyear Tire & Rubber Company,
Akron, Ohio

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE!

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

And Remember

NOTHING ELSE TAKES IT LIKE 3-T NYLON

an EXTRA MARGIN of Strength-

without Excess Weight

The unique two-section boom used on Bucyrus-Erie 4½- to 8-cu. yd. Ward Leonard electric shovels solves one of the problems of front-end construction on heavy-duty excavators in a sound, practical way. It provides the strength needed to withstand the shock loads of digging, yet is remarkably light in weight to help keep swing inertia low.

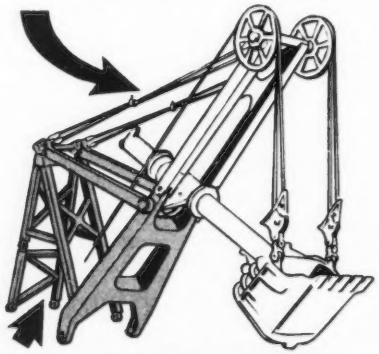
The two-section boom is only one example of *that extra margin* built into Bucyrus-Erie heavy-duty excavators—an extra margin in design *that pays off in extra loads and more output.* There's much more to the story—the tubular dipper handle, the independent rope crowd, the twin dual hoist ropes, the deck location of crowd machinery, the improved dipper design. Write for complete information on the model of your choice—the 4½-yd. 110-B, the 6-yd. 150-B, and the 8-yd. 190-B.

BUCYRUS ERIE

23L54

SOUTH MILWAUKEE, WISCONSIN

Upper boom section, bridge-strand connected to the A-frame, is relatively lighter in construction, because it has to carry only the loads resulting from the pull of the hoist ropes and from the acceleration and deceleration of the swing.

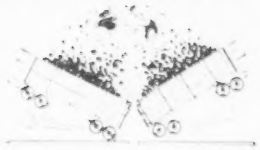


Sturdy lower section, securely attached to the A-frame by pin-connected struts to form an integral part of the machine, has ample strength to take the stresses and shock loads of the digging cycle. Widespread boom feet provide a brace effect to take swing loads . . . no cable suspension or sway braces are required.

AT THE MINING SHOW • SAN FRANCISCO, SEPT. 20-23

visit Booth 911 and see a 150-B electric shovel model in operation.

How ANHYDREX helps make haulage safer



Haulage ranked second as a man-killer in coal mining last year. Signal blocks and automatic switching help lower haulage hazards. Simplex-ANHYDREX Signal Cables, connecting signal and switching equipment, insure the safest, most dependable operation money can buy.

Because moisture causes more mine cable trouble than anything else, Simplex Mine Signal Cables are Anhydrex-insulated. They're guaranteed not to absorb more than 20 milligrams of water per square inch after 7 days at 158°F. They have *NEVER FAILED* from water absorption.

Simplex-ANHYDREX Signal Cables are designed to give the highest continuity of service. For increased protection against electrical hazards and physical abuse, they are neoprene-jacketed to resist abrasion, acids, alkalies, oil and heat.

They may be buried directly or run in ducts. If you have a particular mine signal cable problem, Simplex-ANHYDREX Cables can be adapted to meet it. For more information about how Simplex-ANHYDREX Signal Cables help make haulage safer, send for Catalog No. 1013.

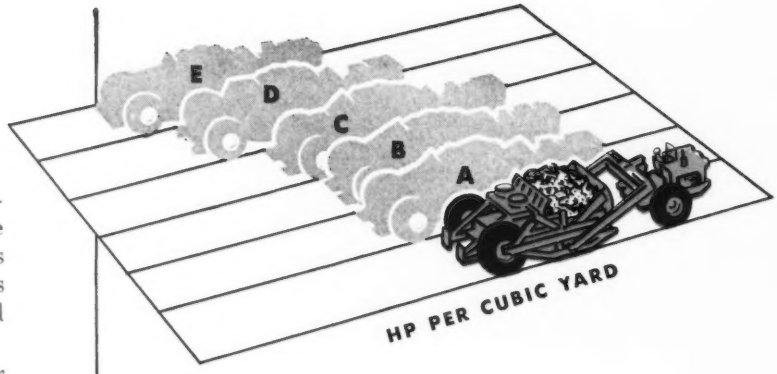
Simplex–ANHYDREX

Signal Cables

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

COMPARE POWER, BALANCE AND TRACTION AND

Why Allis-Chalmers Motor Scrapers



Examine the Allis-Chalmers TS-200 or TS-300 Motor Scraper point by point, feature by feature. Then let your Allis-Chalmers dealer demonstrate what these features mean to you in terms of bonus yardage and dependable performance.

See how fast Allis-Chalmers Motor Scrapers accelerate to "get the jump" on normal production from the moment they leave the pusher. See how safely they high-ball with a full load . . . how fast and steady they pull through the deep fill and return, up grade, to start a new cycle. Compare these Motor Scrapers on the basis of work done per dollar of investment. We think you'll agree an Allis-Chalmers Motor Scraper is your *number one* earth-moving value.

ACCELERATES FAST

The TS-200 develops 17.6 hp per cu yd struck capacity . . . the TS-300 develops 20—the highest ratios in their respective classes. With more power to move the payload, these machines get away from the pusher *fast* and maintain high average speeds throughout the entire cycle.

PERFORMANCE MAKES DOLLARS WHEN DESIGN

YOU'LL SEE

Out-produce

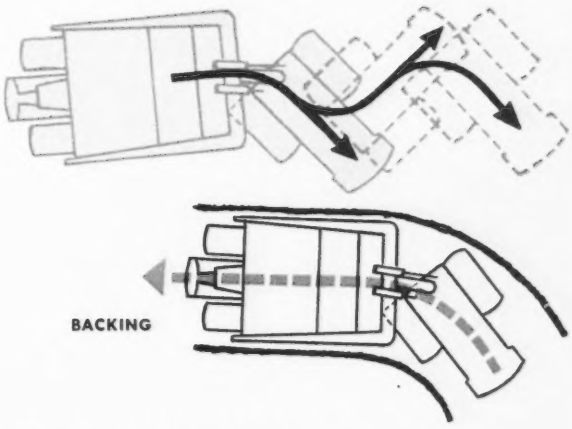
WEIGHT DISTRIBUTION LOADED

50 PERCENT 50 PERCENT

HIGHBALLS WITH THE PAYLOAD SAFELY

Loaded, the Allis-Chalmers Motor Scraper has equal weight on all four tires. This ideal weight distribution, together with low center of gravity, direct hydraulic steering which eliminates jackknifing, and big air brakes on all four wheels, allows the Allis-Chalmers Motor Scraper to take advantage of its high hp ratios by maintaining fast, yet safe haul speeds.

DUCK-WALKING



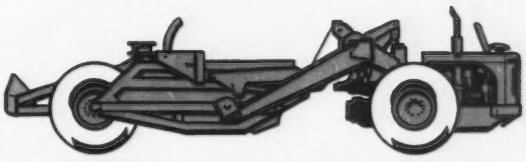
MANEUVERS EASILY

There are no steering brakes to rob you of tractive power. Instead, direct hydraulic rams turn the tractor in the desired direction of travel. Steering is sure and positive—even going down extremely steep slopes in loose footing.

By swinging tractor left and right with the steering rams, the Allis-Chalmers Motor Scraper can duck-walk through heavy going where others bog down.

Backing up in close quarters is simple. Two-wheel tractor has complete control over scraper body . . . can even change directions without forward or backward movement.

WEIGHT DISTRIBUTION EMPTY



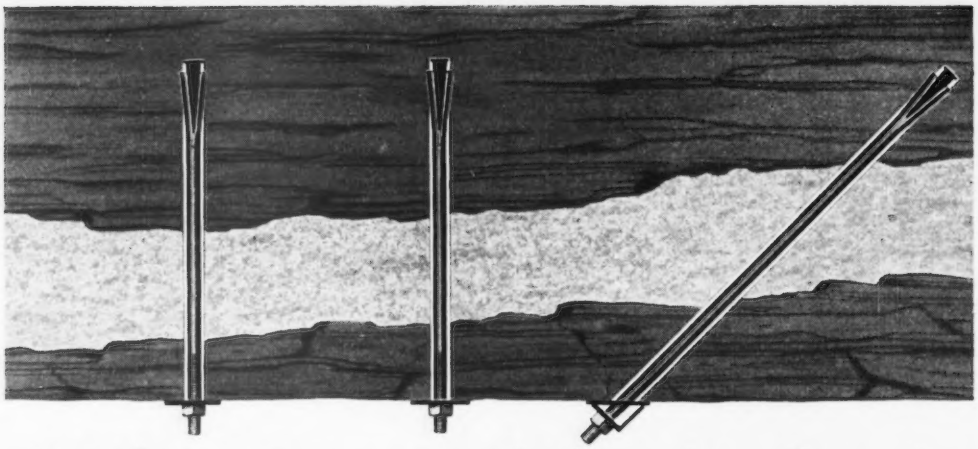
34 PERCENT 66 PERCENT

COMPLETES THE ROUND TRIP QUICKLY

The return trip from the fill is usually uphill. That's where two-wheel design pays off. When empty, 66 percent of the Motor Scraper's weight is carried on the traction wheels. There are no front wheels to rob drive wheels of tractive weight or to create rolling resistance in heavy going. This enables the Motor Scraper to make the round trip faster and usually in higher gear than other units.

MAKES SENSE

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



Roof Bolting Promotes Safety by Clamping Roof Strata into Thick Beam

HOLDS STRATA AS SINGLE UNIT

Roof bolting makes any mine a safer, more productive mine. This is because the bolts consolidate several strata into a single-unit thick beam.

Besides providing increased safety for workers, roof bolting also helps to step up production, because there are wider clearances and increased room in which to operate mechanized equipment. Ventilation is improved, too.

To facilitate economical roof bolting, Bethlehem manufactures a slotted bolt, which is used with a steel wedge; also three types of roof bolts for use with expansion shells. All four types of bolts come in lengths of from 2 ft to 8 ft. For additional details, get in touch with the nearest Bethlehem office.

SLOTTED BOLT A 1-in. bolt having a centered, forged slot. No material is removed when slotting. Other end of bolt has 5 in. of rolled threads. Intended for 1¼-in. hole. When bolt is driven against back of hole, steel wedge is forced deep into slot, expanding ends of bolt. Truncated-cone point prevents thread damage. Usually supplied with American Standard Regular Square Nut.

SQUARE-HEAD ROOF BOLTS (Three types)

1. Square-head ¾-in. carbon-steel bolt.
   Minimum breaking load, 20,000 lb.
2. Square-head ⅞-in. high-strength bolt.
   Minimum breaking load, 20,000 lb.
3. Square-head ⅞-in. high-strength bolt.
   Minimum breaking load, 40,000 lb.

Bethlehem's square-head bolts come with or without ears on the shanks, to accommodate the Bethlehem 4-leaf Type C expansion shell, or the matching-halves Type F expansion shell.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM MINE ROOF BOLTS

FAST LOADING ON INCLINES

Speed up sinking on inclined shafts by using Eimco RockerShovels with patented snubber attachments for digging on steep grades (maximum 45 degrees).

Special equipment on the Eimco machine is assembled at the factory which assures the proper angle of step plate and proper elements to make the loader stay on the track and to assure the user of a full load in the car.

Eimco incline loading machines save many times their price in sinking inclines that are only a few hundred feet long. Any Eimco used for slope loading can be easily converted to standard design for loading on the level.

Eimco has no yearly models, but is constantly adding new improvements to all Eimco machines. The revised machine is sold as the same model number at no increase in price giving you the advantages of a vastly improved machine with greater dependability, greater efficiency and greater saving per ton loaded.

Write for further information.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Texas Birmingham, Ala. Duluth, Minn. Kellogg, Ida. London, Eng. Paris, France Milan, Italy

You Can't Beat An Eimco!

Dumptor hauls along trestles .

. . or tunnels

without turning

Shuttling back and forth between the loading unit and dump area, Koehring Dumptor travels round-trip without turning. It operates with equal ease in both directions on overhead trestles, in confined underground mines, on open-pit ledges and narrow haul roads. Dumptor gets this unique no-turn advantage through a constant-mesh transmission that gives the same 3-speed travel in either direction.

Every turn eliminated cuts 15 seconds off cycle time. This adds up to a substantial increase in yards hauled per hour. For example, by saving only 2 turns, time studies prove that Dumptor increases hourly yardage output more than 10% on an average 1,000-foot haul.

One-second gravity-dumping also maintains a high rate of production. To dump, operator trips body-release lever, and the 6-yard body instantly tilts 70°. One second later the load is out, and Dumptor is on its way back for the next load. There's no 15 to 25-second wait for slow-acting hydraulic or electric body hoists. What's more, gravity-dump never balks, never wears out.

To learn what these Dumptor advantages can mean in increased production and lower hauling costs on your work, call your Koehring distributor, or write for Dumptor® catalog.

KOEHRING COMPANY

Milwaukee 16, Wisconsin

Subsidiaries: PARSONS • KWIK-MIX • JOHNSON K440

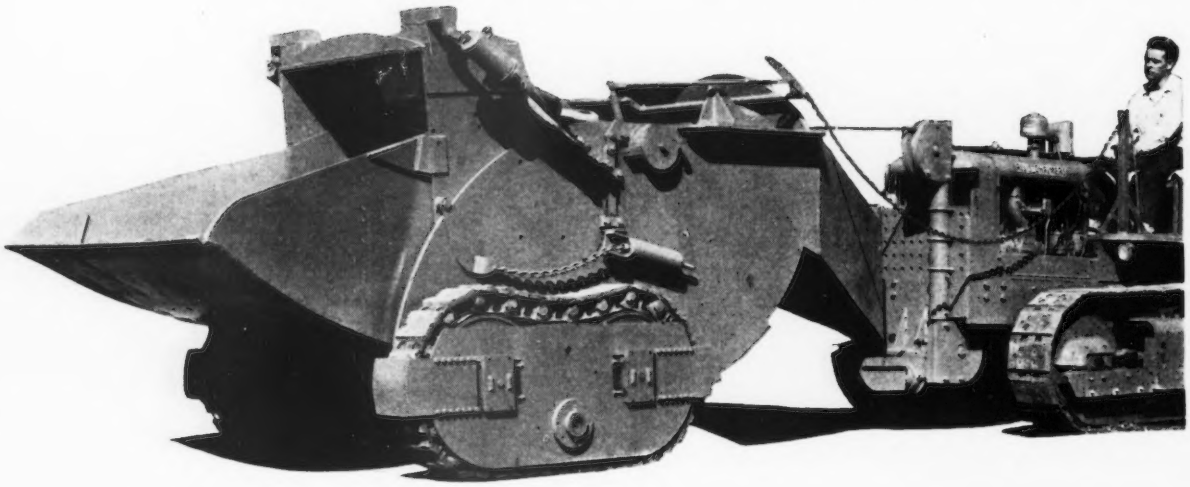
On trackless mining operation, Koehring 6-yard Dumptor goes underground . . . shuttles in and out of access tunnel without turning. This heavy-duty hauler has over 6 h.p. per ton of loaded weight, climbs 24% ramps, grades.

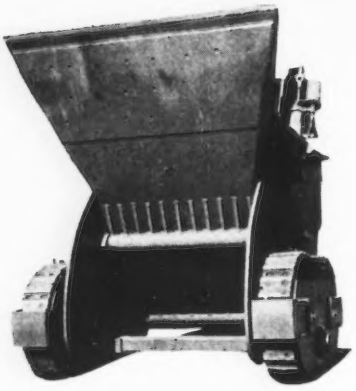
Dumptor puts stockpiling on a fast, shuttle-haul basis. It drives up to edge of pile, body forward . . . dumps, and heads back for next load without turning. Instant gravity-dump action kicks the load out over edge of the bank . . . saves a lot of dozer clean-up on the stockpile.

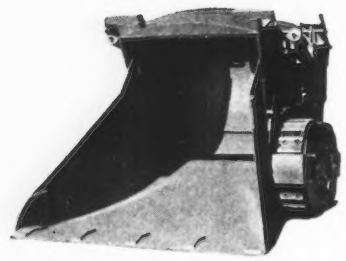
Big square body opening permits loading over either end or sides. Dumptor above is teamed with Koehring 1½-yard 605 shovel . . . a big-production combination. Other Koehring excavators: ½ to 2½ yards . . . cranes up to 79½ tons.

Available Soon...the GISMO!

— the hard rock self-loading transport that is making low cost . . . high tonnage production history at Grandview!







Two photos above show extreme positions shovel mechanism takes while loading. Lower photo shows shovel ready to begin loading cycle and top photo shows position of shovel at end of cycle, loading material back into body.

YOU'VE SEEN ARTICLES on the results the Gismo method has been obtaining at American Zinc, Lead and Smelting Company's Grandview mine operation . . . the Gismo method that performs the entire excavation operation—drilling, loading and transporting rock to dump stations for transfer to the regular haulage system. Here are the latest figures through May, 1954, released by American Zinc:

The Gismo has raised tonnage per man-shift from 8.95 with conventional methods in 1950 to 36.28 in May, 1954.

It has cut labor costs per ton from $1.57 in 1950 to 61¢ in May, 1954.

Supply costs have been reduced from 63¢ to 49¢ per ton despite higher prices for supplies in 1953 and first half of 1954.

Requiring less development, the Gismo has more than halved development costs, requiring less than 50¢ a ton.

The Gismo method comprises—First, the Gismo, a crawler mounted self-loading transport with drilling attachment. Second, a crawler tractor of required size equipped with a winch, cable and controls.

How does the Gismo method work? Its operation is simple. The tractor moves a Gismo unit, converted to a stope drilling jumbo, to face for drilling. The tractor is then attached to a second Gismo and loading and transport of ore is started. For the purpose of grade control, operator may load out different headings and in desired proportions as required. The entire Gismo operation . . . digging, loading, hauling and dumping, is handled by only one man, the tractor operator. Tractor is constantly on the move.

Actual mine operation experience (2½ years) at Grandview has established as unquestionable proof: (1) The Gismo method of mining can cut your operating costs as much as 50% while increasing production many times. (2) This new equipment costs less than the conventional equipment it replaces. (3) Production savings by this Gismo mechanized method are so great that they enable the equipment to pay for itself in a matter of months. Write, wire or call us for complete information. *Sanford-Day Iron Works, P. O. Box 1511 . . . Telephone 3-4191, Knoxville, Tennessee*

Ask us about the *S-D Gismo* . . . *S-D Automatics* . . . *S-D Granby Cars* . . . *S-D Rocker Cars*. Visit us at Booth 314 at the San Francisco Metal and Non-Metallic Mine Show and discuss your needs with our engineers.

Sanford-Day IRON WORKS

KNOXVILLE • TENNESSEE

BROWN-FAYRO DIVISION
JOHNSTOWN, PA.

MINE CARS, All Types - PRECISION WHEELS - "Brownie" HOISTS CAR RETARDERS - SPOTTERS PUMPS - OIL SPRAY SYSTEMS

1 STEP UP SHOVEL SPEED, YARDAGE. This shovel performs faster, more smoothly, thanks to G-E drive system with amplidyne control. Digging power is increased. The G-E amplidyne system improves response and acceleration. It controls shovel motions precisely, and also prevents excessive current and torque peaks which might damage equipment.

5 ways General Electric can help you mine more tons per man-hour

1. **Step up shovel speed, yardage**
2. **Haul more ore**
3. **Get full voltage at point of use**
4. **Cut relocation time**
5. **Increase drill footage**

SEE NEXT PAGE FOR DETAILS

GENERAL ELECTRIC

2 HAUL MORE ORE. High availability of General Electric locomotives means you can haul greater tonnages. In normal use, G-E locomotives are on the job 24 hours a day, seven days a week, with little time required for maintenance.

G-E ENGINEERED ELECTRICAL SYSTEMS MEAN

Faster open pit mining at less cost

You need speed, flexibility, and safety in your open pit mining operations if you are to meet present demands for higher production per man-hour. General Electric's modern, engineered electrical systems can help you do this in five ways:

1. You can speed up the digging cycle. G-E amplidyne-controlled drives provide faster hoist, swing, and crowd action on power shovels. Shovels work around the clock with minimum time lost for maintenance or repairs.

2. You can haul greater tonnages. G-E locomotives have outstanding records for high availability. They maneuver rapidly, efficiently, and help speed all switching operations. Easily accessible for maintenance.

3. You can increase mining efficiency and safety with G-E unit substations. They improve voltage levels—make full equipment capacity available. Distribution losses are reduced. Grounding systems help protect personnel and equipment.

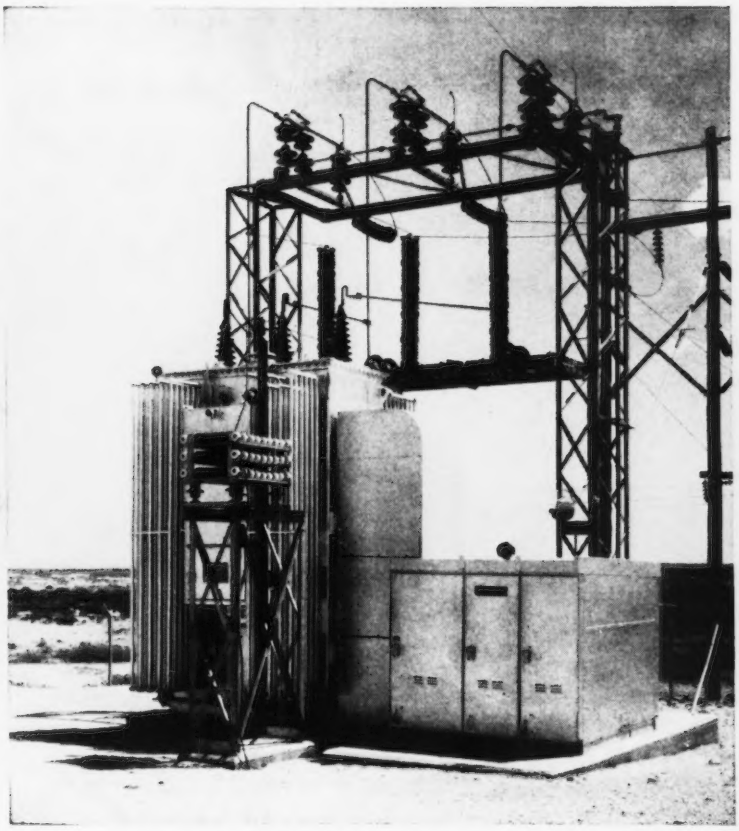
4. G-E cable-skid switch houses give a more flexible power system arrangement. You can cut relocation time of all equipment. Moving is simplified. Cable connecting time is minimized.

5. You can step up drilling speed. Modern rotary and churn drills, powered by General Electric, are self-propelled. Smooth, fast control and rugged motors help them to drill harder rock at higher speeds.

These production-boosting techniques can be applied to your surface mining operation. A G-E mining industry specialist can show you how. Contact him at your nearest G-E Apparatus Sales Office. General Electric Company, Schenectady 5, New York. 660-31

Engineered Electrical Systems for the Mining Industry

GENERAL ELECTRIC



3 GET FULL VOLTAGE AT POINT OF USE by locating G-E factory-assembled unit substations near work area for full equipment capacity. Magne-blast breakers help protect feeders; lightning arresters help prevent outages; grounding resistors increase safety.

4 CUT RELOCATION TIME. Standard G-E cable-skid switch house has polarized couplers to simplify and speed up cable interchanging. Easy-to-move skid house means flexible power system.

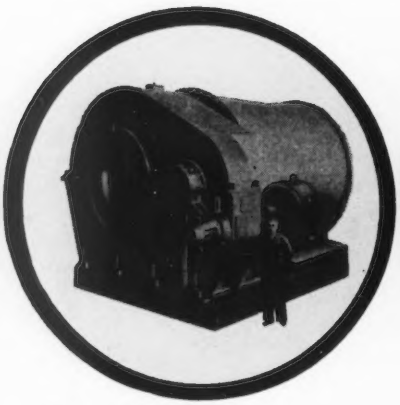
5 INCREASE DRILL FOOTAGE. Self-contained churn drill, powered by G.E., provides rapid rock penetration, promotes effective drilling, blasting practices.

KENNEDY...

Your assurance of Top

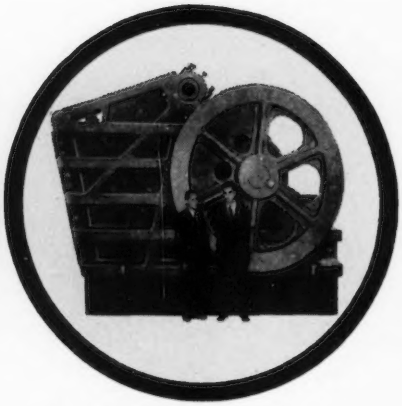
GEARLESS GYRATORY CRUSHER

Two discharge outlets eliminate clogging of sticky clay. Handles all types of rock and ore.



INTEGRAL GEAR DRIVE

Furnished on mills of any diameter and length. Self-aligning bearings, gears automatically oil sprayed. Patented perfection in mill design.



SWING JAW CRUSHER

Open hearth or Herculite steel — Reversible jaw plates, end-to-end, side-to-side, providing double wear. Jaws and shaft cast integral can't work loose.

KVS Equipment remains the best at its price

Substantial savings in power. Economical operation — low maintenance cost.

Minimum parts replacement. Continuous operation under most severe conditions.

Peak production . . . cost-saving efficiency. No sticking or clogging.

All controls within easy reach. Designed for ease of installation.

Wide range of primary and secondary crusher sizes.

Crushing and Mining Machinery & Equipment

performance!

In use throughout the world, KVS crushing and mining machinery saves time and produces peak capacities on every shift.

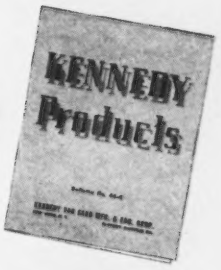
Noted for stamina, strength and versatility, KVS crushers and mills are handling all grades of rock and ore from Tachonite to limestone. Years of rugged service in the field prove the *lasting* efficiency and economical operation of this outstanding equipment.

Before you specify, consult KVS sales-engineering department. Over a half-century of "know-how" is at your disposal. Consultation anywhere in the world.

Send for bulletin describing KVS crushing and mining machinery.

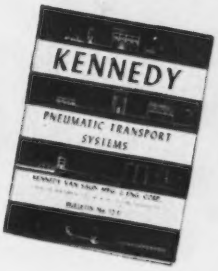
BULLETIN #49A
Crushers, Conveyors, Elevators, Screens, Classifiers, etc.

BULLETIN #44C
Tube, Ball and Rod Mills for wet or dry grinding.



BULLETIN #44D
Cement Kilns, Coolers, Dryers, Preheaters, Deheaters, Soaking Pits, etc.

BULLETIN #52F
Automatic Pneumatic Transport Systems, Air Conveyors, Air activated Containers.



KENNEDY-VAN SAUN

MANUFACTURING & ENGINEERING CORPORATION

TWO PARK AVENUE, NEW YORK, N. Y. • FACTORY: DANVILLE, PA.

JOY STOPERS—Lightweight and heavy-duty models with standard or telescopic feed, steel changes to 36", short overall length. Write for Bulletin 87-G.

...UNDERGROUND PRODUCTION PROBLEMS ?

DRILL, LOAD, HAUL, HOIST, SCRAPE, VENTILATE

The Modern JOY Way

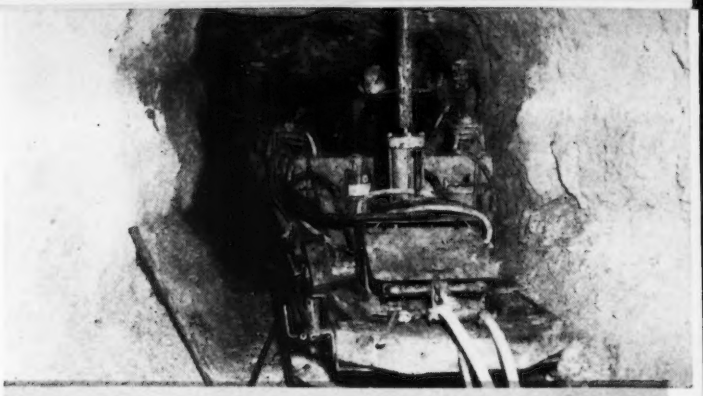
Whatever your mining problem, there's a modern Joy machine to handle the job quickly, easily, efficiently.

Select the equipment in which you are most interested, and write for detail-packed bulletins TODAY. *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.* In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

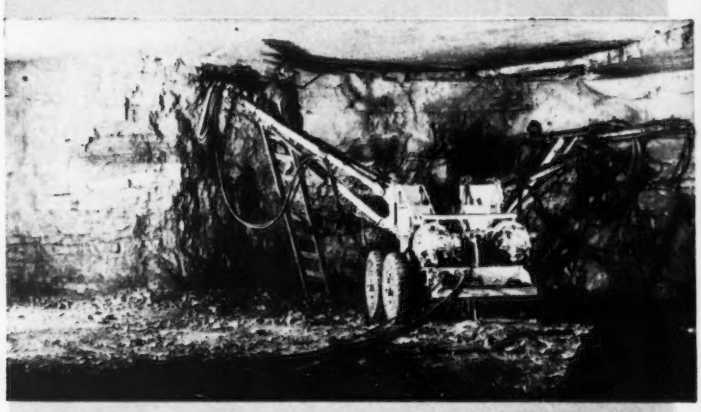
JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

W&D M 5360

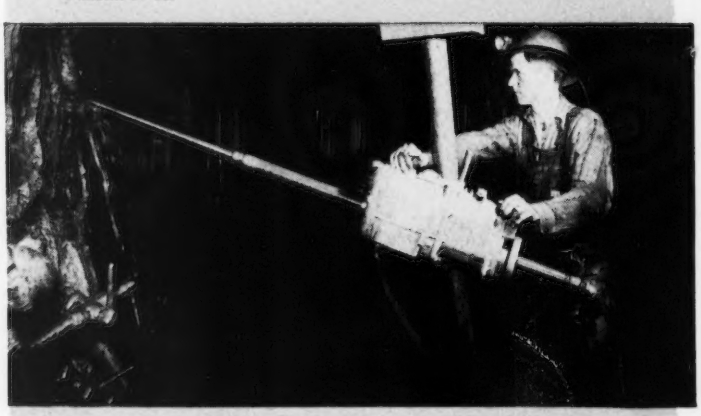


JIB JUMBO—Track-mounted Jumbo with drills on hydraulically-controlled Hydro Drill Jibs for fast, easy drilling. Ask for Bulletin 87-F.



DRILLMOBILE—Rubber-tired, self-propelled Jumbo with drills on Hydro Drill Jibs. Long chain feeds. Bulletin 87-F.

AIR LEG—Easy-to-handle air leg with "one-hand control" built into drill backhead. Perfect in combination with Joy LM-47 Drill. Bulletin 87-M.



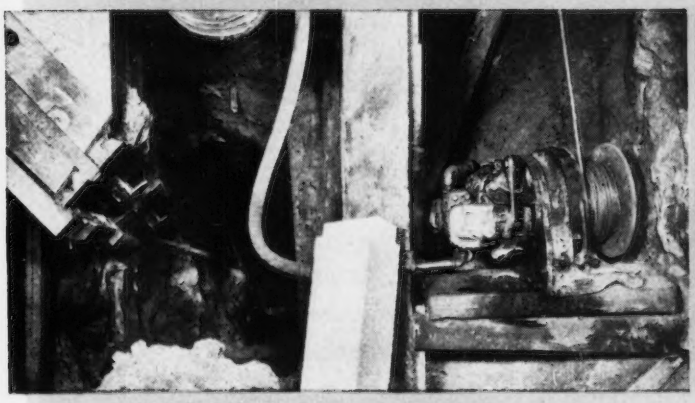
HS-15 CORE AND BLASTHOLE DRILL—Air-driven rotary drill for column mounting. In-line drive. Choice of speed ranges. Bulletin D-32.

18-HR-2 LOADER—High capacity loading machine for rock and ore. *12 tons per minute.* Ruggedly built to withstand rough usage, abrasion. Bulletin J-108.

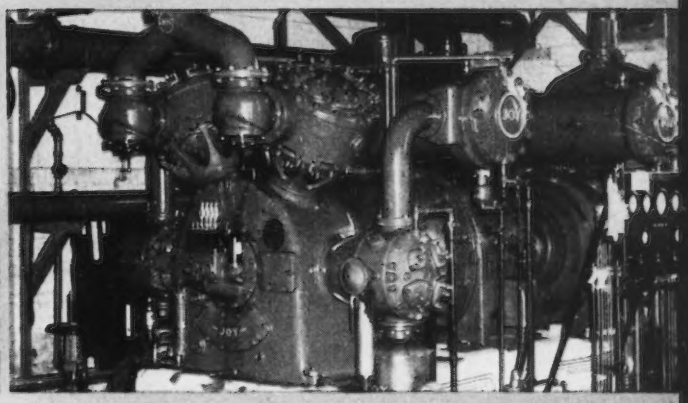
SHUTTLE CARS—Cable reel, battery, or diesel-electric types in various capacities. Extra rugged for rock and ore haulage. Bulletin J-202.

ELECTRICAL CONNECTORS—Watertight, one-piece Neoprene connectors for use with any electrical mining equipment. Sizes and styles for all uses. Bulletin B-56.

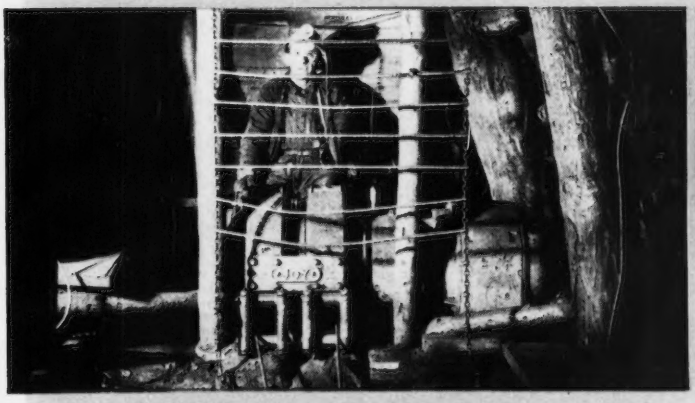
JOY CONVEYORS—Complete line of belt, shaker and chain conveyors for any underground application. Bulletin LD-102.



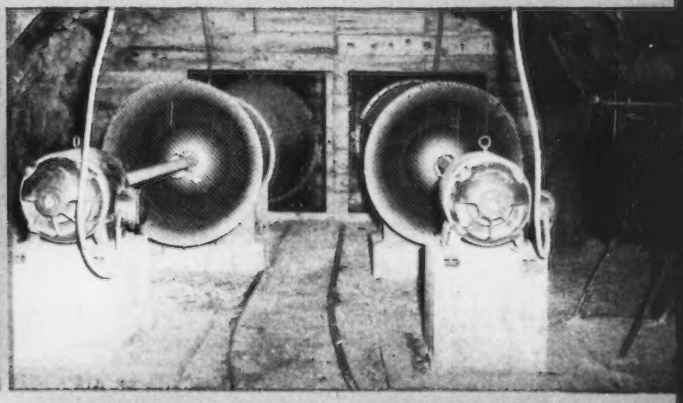
SINGLE DRUM HOISTS—Air or electric drive, lifting capacities 500 to 3500 lbs., rope capacities to 1500 feet. Bulletin 76-X. Also single and two-drum shaft hoists to 150 HP.



AIR COMPRESSORS—Dependable air power supply. Displacements from 81 to 3896 CFM. Single and two stage units for every need. Bulletin M-201.



SLUSHERS—Two and three-drum models, 5 to 150 HP, rope pulls to 15,000 lbs., air or electric drive. Bulletin 76-Y.



AXIVANE FANS—Portable blowers, adjustable-blade fans, and large mine fans. A size for every ventilating job. Bulletin J-607.

TEAMED FOR DRILLING EFFICIENCY....

Crucible CA Double Diamond Alloy Hollow Drill Rods

Crucible HY-Tuf for tungsten carbide bit bodies

Here's a combination you just can't beat . . . detachable bits of Crucible HY-Tuf® alloy steel with tungsten carbide inserts and Crucible CA Double Diamond® Alloy Hollow Drill Rods . . . the toughest, longest-lasting drill steel made.

HY-Tuf detachable bit bodies are made to withstand the terrific pounding of heavy rock drills . . . pounding which no ordinary steel can possibly take. And Crucible CA Double Diamond Rods give you superior drilling performance with minimum rod breakage and bit losses . . . a *team* that provides the *lowest cost per foot of hole drilled.*

54 *years of Fine steelmaking*

CRUCIBLE first name in special purpose steels

HOLLOW DRILL ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

E&MJ NEW PRODUCTS DIGEST

FEATURE

Now You Can Buy A Gismo

THE GISMO, a self-loading transport that has made low-cost and high tonnage records at the Grandview mine of American Zinc, Lead and Smelting Co., will be manufactured by Sanford-Day Iron Works, Inc., Knoxville, Tenn. It was in the February 1953 issue of *Engineering and Mining Journal* that the Gismo was first introduced to the mining industry at large.

Manufacture of the Gismo follows actual mine operation of over two years at Grandview. Some of it's accomplishments include:

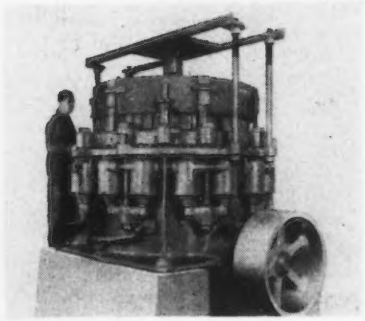
(1) raising tonnage per man shift from 15.15 in 1950 to 122.05 in 1953;

(2) cutting labor costs per ton from $1.57 in 1950 to 72c despite higher wage scales in 1953;

(3) reducing supply costs from 63c to 57c per ton despite higher prices for supplies;

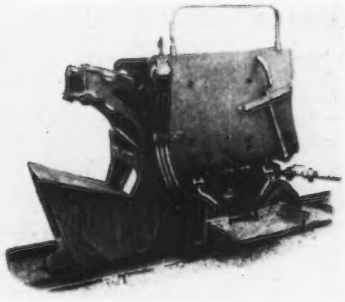
(4) halving development costs to 50c per ton;

(5) saving enough in production costs to pay for the cost of Gismo and accessories in 6 weeks. (See *E&MJ*, May 1954, pp 56-59.) **(1)**



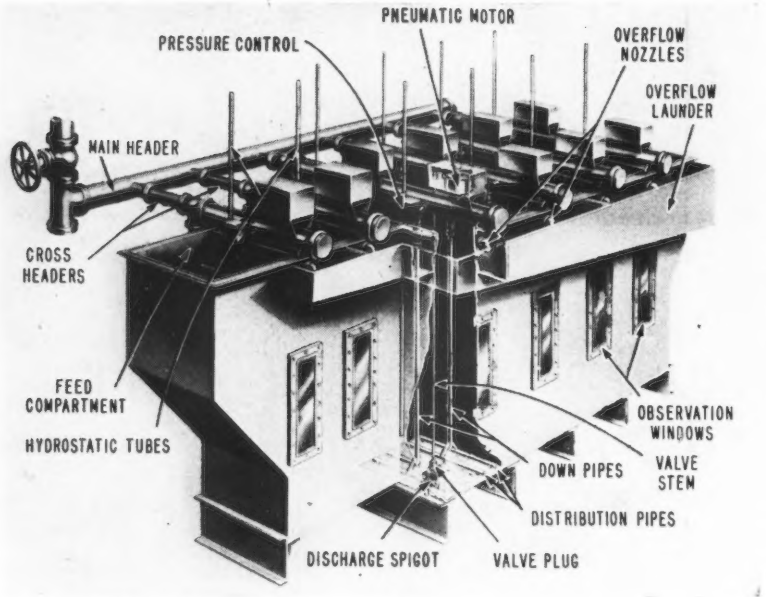
GYRADISC

The Gyradisc, built by Nordberg Mfg. Co., Milwaukee, Wis., to supplement the Symons Cone Crushers, is said to provide still finer reduction than that heretofore obtainable in conventional reduction machines. The method of communition, using the Gruender method of reduction, is a process of alternately impacting and releasing a thick mass of material, resulting in the production of large tonnages of fine particles. Relatively large particles combined in an intimately mixed feed which is automatically distributed throughout the crushing chamber prevents packing of the mass and assures high output. Mixing and feeding are accomplished and controlled by the compound action of gyration and rotation of the feed distributor. **(2)**



MINE CAR LOADER

Underground loader, the Gardner-Denver Model GD10, is equipped with a 4¾ cu ft dipper and is reported to load mine cars at the rate of about 1½ tons per minute. Safety features include a clean exterior design, low center of gravity, and



HYDRAULIC CLASSIFIER

Dorrco Jet Sizer, a hindered settling hydraulic classifier, for the sizing and grading of solids 8 mesh and finer, will produce, on a continuous and completely automatic basis, any desired number of sharply sized fractions from feed having a wide particle size distribution.

Basically, the Jet Sizer consists of individual compartments or pockets which, with the exception of the first half size pocket, are of equal area. Arrangement of compartments is extremely flexible depending upon the feed tonnage and desired number of products. Pockets may be situated single in series or in transverse banks of two, three, or four abreast.

Water under pressure is distributed from an elevated header to four horizontal pipes along the bottom of each pocket. Water enters compartments through a series of small nozzles at selected spacings. Continuous discharge of sized particles is controlled by an automatic, pneumatically operated system.

In operation, minus 8 mesh feed pulp is introduced to the first pocket where coarsest particles are scalped out. Here, the upward velocity of the hydraulic water holds particles of a narrow size range in suspension or "teeter" in the bottom of the compartment. Finer material is classified out and overflows a submerged weir to the second pocket which operates at a slightly reduced water velocity. The same hindered classification takes place again, and a second fraction is produced. Similarly, each pocket yields a closely graded product. The fractions from two or more pockets abreast are combined, and in large units, products of two or more banks may be blended. Those particles not retained in the last pocket overflow to waste or further treatment.

Major advantages claimed are the elimination of expensive constriction plate construction and unusual flexibility of pocket arrangement. Removable water distribution pipes simplify maintenance, and operating costs are low because of negligible power required. Low head hydraulic water is inexpensive and may be reclaimed or reused. Attention is necessary only when major changes occur in feed characteristics.

The Jet Sizer is available with from 1½ to 21½ pockets. Increase in the maximum number of pockets permits unit to handle flows previously requiring two or more smaller machines. Tonnage processed is dependent upon the type of material, particle size distribution and specific gravity. Further informaton can be obtained from Dorr Co., Stamford, Conn., by circling No. 3 on reply card opposite p 42. **(3)**

high-flange, wide-tread wheels that prevent rail jumping. Both the traction motor and dipper motor controls—as well as the step plate—can be easily and quickly moved to either side of the machine so that the operator is always in the safest position. Power is supplied by 5-cylinder, radial air motors. Gardner-Denver Co., Quincy, Ill. **(4)**

ENGINES AND ELECTRIC SETS

New higher rpm continuous ratings for CAT D337 and D326 engines and electric sets in both self- and externally-regulated types have been announced by Caterpillar Tractor Co., Peoria, Ill. These engines are now available for continuous operation 24 hours a day at 1800 rpm.

Continuous duty is now available at 1800 rpm for externally-regulated D337 Electric Sets at an output of 110 kw and for externally-regulated D326 Electric Sets at an output of 85 kw. Similar operation for self-regulated electric sets is available at an output of 103 kw for D337 Electric Sets and 80 kw for D326 Electric Sets. **(5)**

BELT IDLERS

Jeffrey Manufacturing Co., Columbus, Ohio, has announced its latest MD and HD Series belt idlers with the new Duoflex seal. Main feature is the dual flexible contact seals which perform the double function of keeping out dirt and retaining the grease, for practically an endless period of time. Design of the idler permits re-greasing from either end when and if desirable, through the shaft, the grease reservoir and the new "Neoprene" shaft connectors. **(6)**

DRILL RIG

Ingersoll-Rand has introduced a new self-contained and self-propelled twin-drill rig designed to cut cost and speed operations on heavy-duty wagon drill type jobs. The completely integrated unit includes two hydraulic booms, two 10-ft wagon drill towers, two heavy-duty X-71-WD rock drills, a rugged crawler assembly and a 600-ft Gyro-Flo rotary compressor. The manufacturer claims that the machine will do the equivalent work of at least three heavy-duty wagon drills. Requires only two operators. Utilizes two X-71-WD drills with an 8 ft steel change. Will drill holes up to 18 ft 6 in. between centers. **(7)**

TRACTOR SHOVELS

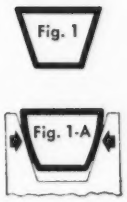
Six separate models of a tractor shovel or front-end-loader will be marketed under the trade name "Michigan Tractor Shovel" by Clark Equipment Co., Buchanan, Mich. With capacities from 15 cu ft to 2¼ cu yd, all models will have torque converters. **(8)**

SHOVEL BUCKET

Standard bucket for the Caterpillar HT4 shovel has been improved by Caterpillar Tractor Co., Peoria, Ill. Adjustable pitch and deeper bowl will give the two-position bucket greater flexibility **(9)**

This simple idea saves money in V-Belt Costs

You can prove it in two minutes!

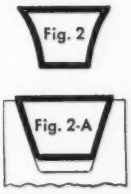


To prove how the CONCAVE SIDES of GATES VULCO ROPES *save money*, just make this simple test—

Bend *any* V-Belt that has *straight sides* (Fig. 1) and—as the belt bends—*feel* the sides *bulge out* (Fig. 1-A). This out-bulge concentrates the wear at the points shown by arrows—and this naturally shortens the life of a *straight-sided* belt!

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)

(U. S. PAT. 1813698)



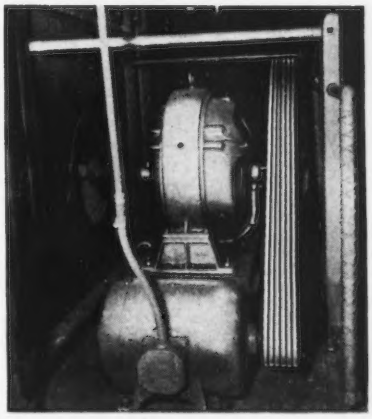
You find that the CONCAVE SIDES *fill out* and become perfectly straight. They thus press *evenly* against the V-pulley. All wear is distributed *uniformly* across the *full width* of the GATES VULCO ROPE—and this means *longer* belt *life* and *lower* belt *cost* for you!

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE SIDES—the GATES VULCO ROPE!

VULCO ROPE DRIVES

THE GATES RUBBER COMPANY
DENVER, U.S.A.

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.



Typical Gates Vulco Rope Drive—the Gates V-Belts are built with Concave Sides to insure longer belt wear.

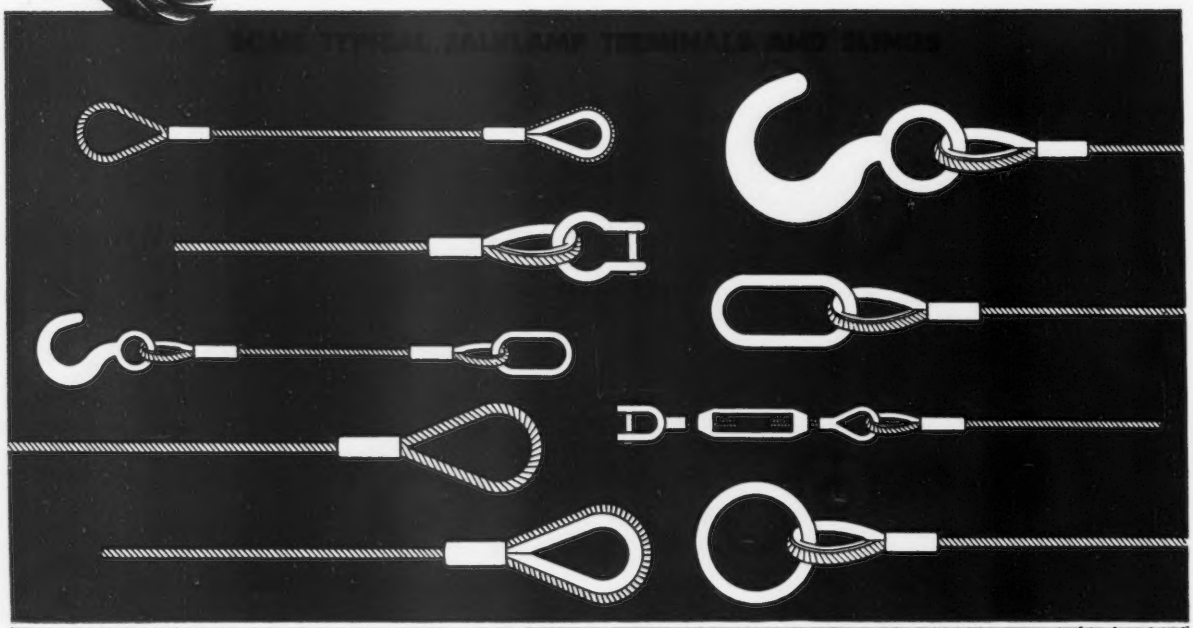
CS-543

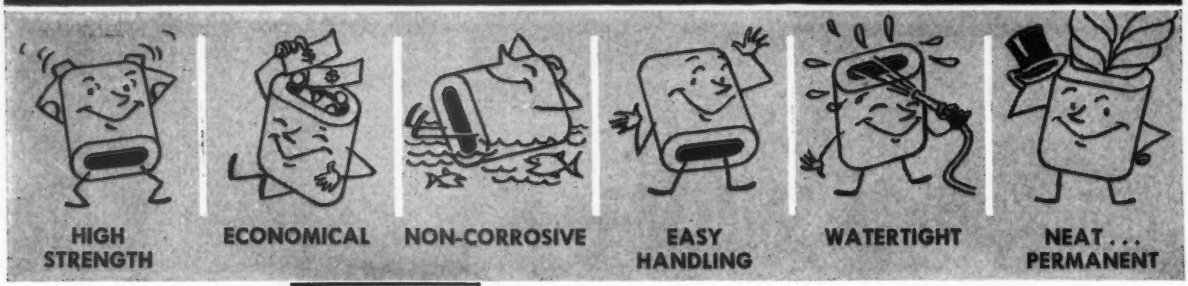
END YOUR SPLICING PROBLEMS WITH J&L JalKlamp SLINGS AND TERMINALS

Now, thanks to JalKlamps, you can order J&L Wire Rope with terminal splices which afford unsurpassed strength, corrosion resistance, safety and ease of handling. *And JalKlamp Terminals cost far less than you would spend to do the job yourself with conventional tucked splices.*

J&L JalKlamps are new non-corrosive special alloy sleeves with tremendous strength and unique cold forming characteristics. When squeezed around wire rope by a special hydraulic press, the JalKlamp metal "flows" into the spaces between the wires in the strands and the strands themselves, producing a neat, homogeneous splice as strong as the rope itself.

Take advantage of the extra economy . . . long service life offered by J&L JalKlamps. You can get J&L Wire Rope Terminals and Slings spliced with JalKlamps in all standard constructions, and in diameters from ⅛″ to 2″ with these centers—SpringKore, PlastiKore, Fibre Core and IWRC.





J&L STEEL

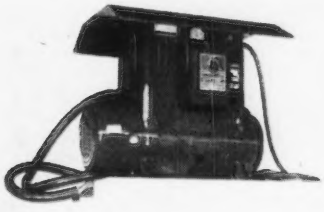
Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

ELECTRIC ROCK DRILL

Homelite Corp., Port Chester, N. Y., announces the Bosch electric rock drill. Said to eliminate the need for air compressors, this versatile drill is powered by a lightweight, rugged, high cycle motor requiring no brushes. Operated from an easily carryable Homelite generator weighing only 130 lb and equipped with the Bosch pressure blower, this tool will drill holes 18 ft deep. **(24)**

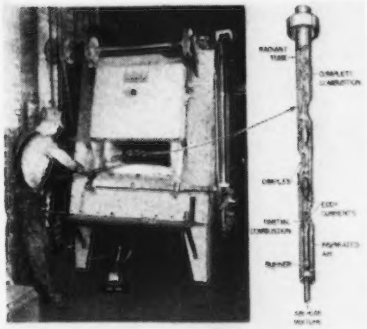
TRENCHING MACHINE

Bucket line speeds as high as 200 rpm make this a fast trenching machine. Trade-named "Earthripper" it will dig trenches from 8 in. to 30 in. wide, up to 8 ft deep. Bucket sizes are interchangeable. Other features include hydraulic operation, fast road speed. It is quickly set up, self leveling and digs at any angle. Owen Pewthers Mfg. Co., Houston, Texas. **(29)**



BATTERY CHARGERS

A complete new line of Hobart automatic battery chargers for mine locomotive batteries is announced by Motor General Corp., Troy, Ohio. A 4-page descriptive data sheet giving complete specifications on standard models of 1 through 4-circuits and up to 50 kw capacity, is available. **(30)**



RADIANT TUBE FURNACE

The first large-scale application of radiant tubes to toolroom-size furnaces was successfully made with Lindberg Engineering Co.'s (Chicago) new gas-fired furnace. The new unit is ideally suited for heat treating virtually all production and tool steels, except high-speed, where it is essential to keep the work scale and decarburization free. Maximum operating temperature is 1850 deg F. **(33)**

ANTI-RIP CONVEYOR BELT

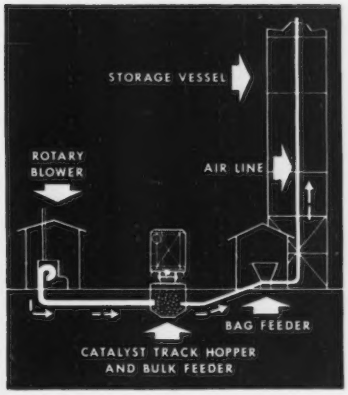
Ribbons of high tensile steel wire, inserted at intervals up to 3 ft, feature a rubber conveyor belt developed by B. F. Goodrich Co., Akron, to prevent accidental rips from running the entire length of belt. Wires act as barriers against rips which can occur in severe belt service when sharp objects penetrate the belt, become jammed and slice the belt like a knife. Used in combination with the B. F. Goodrich patented transcord breaker or longitudinal nylon cord breaker, the new construction is said to increase belt life up to 50%. **(34)**

PORTABLE VENTILATOR

Used as a blower or as an exhauster, the two-way ventilating system is a compact, easily portable ventilator, driven

what's NEW in Engineering

A new electronically-controlled manipulator has been developed by engineers at Argonne National Laboratory to permit scientists to handle "hot" radioactive materials at a distance of several hundred feet or from behind sealed barriers. The new unit, which uses electrical signals, reproduces the same seven basic motions involved in grasping, lifting, moving and turning objects.



Replacing a conventional mechanical batch system of handling catalyst, Kaiser Engineers developed a continuous air stream bulk handling method. Operating costs were reduced by this unique system which moves catalyst at 7½ tons per hour with an attrition loss of less than the 2% maximum guaranteed.

Modern Physics for the Engineer, edited by Louis N. Ridenour, is a collection of lectures given by a group of distinguished physicists and others at the University of California, Los Angeles. The aim of the book is to give engineers a brief account of some of the most interesting developments in this fundamental physical science. Published by McGraw-Hill.

Kaiser Engineers has approximately 600 professional engineers, technical experts and staff ready to tackle your problem in design, engineering or construction. Call or write: Kaiser Engineers Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.

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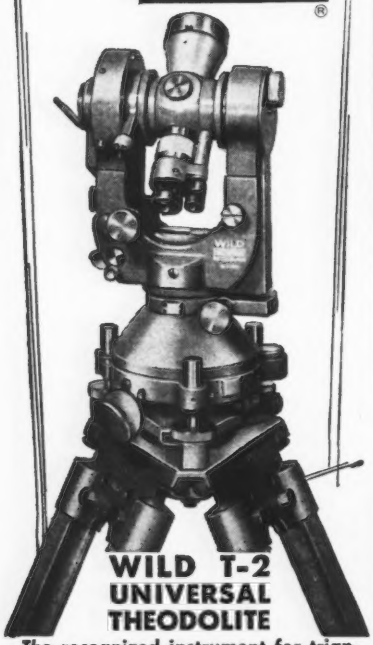

WILD T-2 UNIVERSAL THEODOLITE

The recognized instrument for triangulation, bridgework and other precise engineering jobs... The Instrument For YOU.

You read both circles by microscope . . . direct to one second. Every reading gives the mean of two diametrically opposite points of the circle, and is therefore free from eccentricity-errors.

The optical plummet makes centering above a ground point an easy and quick operation even on windy days. The telescope with its big field of view is "easy on the eye" and can be transited both ways.

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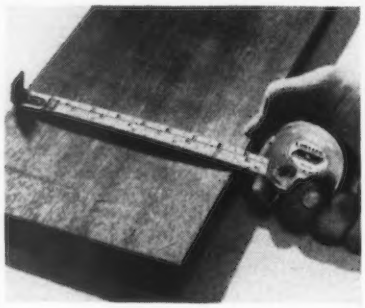
NEW PRODUCTS DIGEST

by a powerful 3450 rpm, explosion-proof electric motor, capable of moving approximately 3000 cfm of air. The ventilator is supplied complete with 15 ft of three-wire electrical cable, and a 15-ft length of 14-in. diameter duct, and two carrying belts. Mine Safety Appliances Co., Pittsburgh. **(35)**



POCKET LUMBER RULE

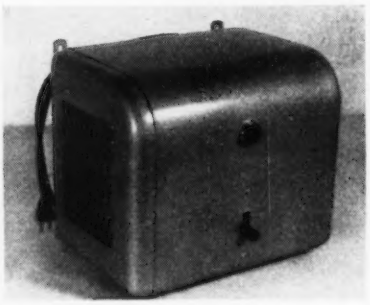
Pocket-size lumber rule (Lumtape) reading directly in board-feet makes possible fast, easy checking of lumber shipments. Cost $5.50. Lumtape Corp., Hillside, N. J. **(36)**

CLUTCHLESS LOADER

Contractors Machinery Co. Inc., Batavia, N. Y., announces a new ¾ cu yd loader Model LH-75 Trojan Loadster which eliminates all clutches; has a direct drive from the engine through a torque converter coupling to the transmission. Four working speeds are provided, as well as a fifth, or high speed range, for traveling. A simple gear-type reversing mechanism provides the full five gear range for either forward or reverse travel. **(37)**

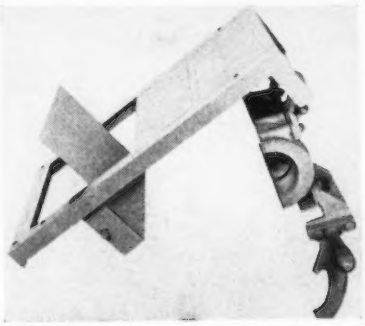
ELECTRIC CABLE SPLICER

A new method for making emergency or permanent splices on mine machine cable from No. 8 stranded through 4/0, which withstand tensions up to 6400 lb has been developed by Burndy Engineering Co., Inc., Norwalk, Conn. Burndy Hylinks, made of pure electrolytic copper seamless tubing, are compression-installed by means of Burndy Hytool MY20-11. This light-weight, easy-to-operate manual tool has a single adjustable nest die in alignment with an index plate calibrated for each size of mine machine cable. A knurled knob controls the position of the nest die. No removable dies are necessary. The Hytool also is calibrated for commercial cable. **(38)**



BATTERY CHARGER

No longer is it necessary for 2-way radio-equipped vehicles to keep engines idling while off-the-road work is being done. Truck batteries now can be charged in the field with a new regulated battery charger, designed primarily for utility work trucks equipped with 2-way radio and other accessories requiring a 6-v dc power supply. It is manufactured by D. W. Onan & Sons, Inc., Minneapolis. Devised for use in the field with an Onan generating plant, it draws its ac input power from the auxiliary electric plant . . . takes over the dc load . . . charges the 6-v storage battery and provides up to 25 amps for powering the 2-way radio equipment before any demand is made on the battery. **(39)**



SPOUT MAGNET

Held in operating position by magnetic force, the spout magnet creates a deep powerful magnetic field that removes dangerous tramp iron from the flow of material. By simply opening the separator, the trap gate is automatically thrown up to block the chute. In this position, tramp iron cannot fall into the product. Magnetic components swing away from chute allowing trapped tramp iron to fall free automatically. Available in various sizes and dimensions. Stearns Magnetic, Inc., Milwaukee, Wis., is the manufacturer. **(40)**

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coarse crushing
screening
fine crushing
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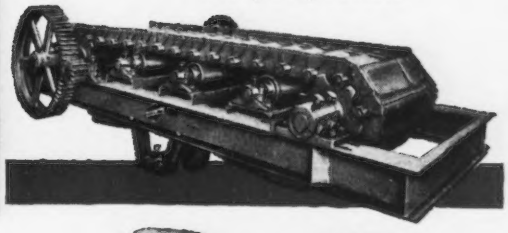
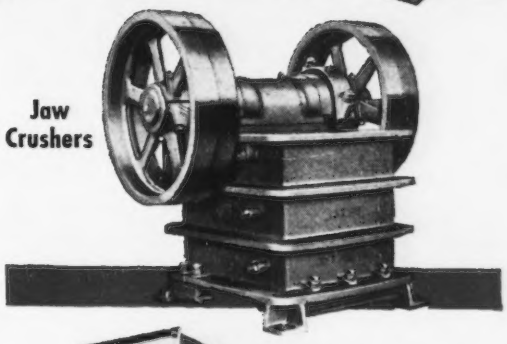
EQUIPMENT FOR MINES

Heavy-Duty Feeders

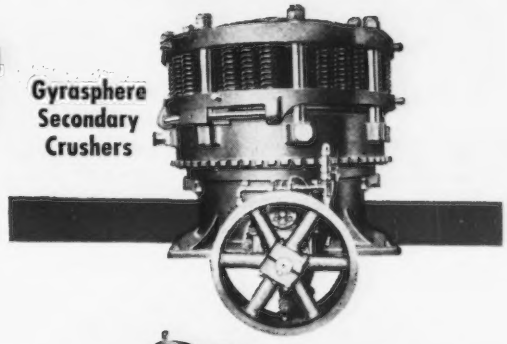


Jaw Crushers



Vibrating Screens

Gyrasphere Secondary Crushers



Min. 36

Super-Scrubbers

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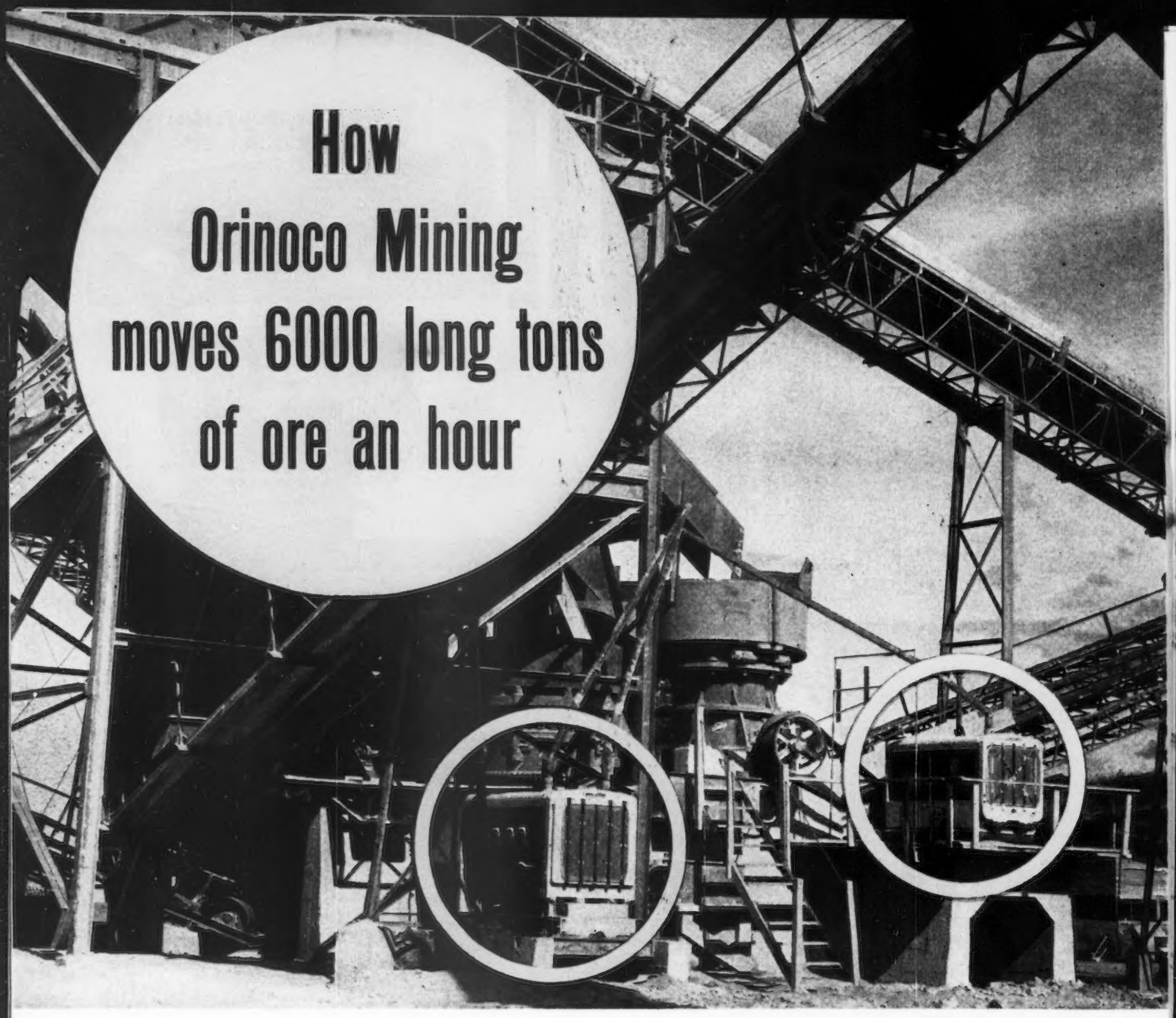
Robert S. Bailey, Los Angeles 17, Calif. • Ontario Eqpt. & Supply Ltd., Toronto, Canada • Gordon Russell, Ltd., Vancouver, B. C.



How Orinoco Mining moves 6000 long tons of ore an hour

Here are two CAT* Diesels helping crush an iron mountain. This team of D17000 and D13000 Engines drives secondary 30″ x 70″ gyratory crushers for Orinoco Mining Co. in Venezuela. A 60″ belt conveyor, traveling 600 feet per minute, delivers ore to this crushing plant from a primary crusher driven by a D364 Diesel Engine. Power for conveyor belts and lights is supplied by Caterpillar Electric Sets.

The iron is the first taken from deposits recently unearthed on Cerro Bolivar, an 1800-foot mountain packed with some 400 million tons of high-grade ore. To get this prize ore to mills, Orinoco Mining built a port to handle ocean-going freighters, put down over 90 miles of railroad and paralleling highway, and raised two complete towns. More than 150 Caterpillar units—engines, electric sets, tractors, scrapers, motor graders, bulldozers—worked on the gigantic job.

Today 6000 long tons of ore an hour—three million tons a year—move down from Cerro Bolivar. Soon shipments will total ten million tons a year. Helping move every ton are Caterpillar units like the engines in the picture. Their specially hardened crankshaft journals, long-lived aluminum alloy bearings, truly effective filters and seals, and other quality features will help keep ore coming from Cerro Bolivar for years. And they'll do it economically, too: Caterpillar-built fuel injection systems let all Cat Diesels deliver full power on low-cost No. 2 furnace oil.

Leading manufacturers can supply Caterpillar power in their draglines, compressors and other mining and excavating machinery. Your Caterpillar Dealer—always ready with prompt service and genuine factory parts—can give you full details on his complete line of Caterpillar Engines and Electric Sets: 12 sizes to 500 HP and 315 KW.

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MODERN HEAVY-DUTY POWER

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

BUILDINGS. Armco Drainage & Metal Products, Inc., Middletown, Ohio, announces a new model Steelox (interlocking steel paneled) building. The 40-ft buildings are available in heights up to 20 ft. Units can be placed side by side, making the total floor area to be enclosed virtually unlimited in width or length. Useful for mine buildings and exploration camps. **(66)**

LATTICE BRAID PACKINGS. A-131 describing Garlock's patented Lattice Braid rod and shaft packings points out construction features and gives available materials, sizes, and forms. Garlock Packing Co., Palmyra, N. Y. **(67)**

TRACTORS. The story of the complete line of Allis-Chalmers Diesel-powered crawler tractors is pictorially told in "Facts . . . on a New Breed of Tractors" just released by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Specifications of each of the four tractors in the A-C line are listed. **(68)**

MOTORIZED REDUCERS. Of practical interest to men who buy or use gear drives up through 75 hp rating, Bulletin 3100-1954 consolidates under one cover the selection tables, dimensions, weights, overhung load ratings, and thrust capacity ratings needed to select horizontal, vertical, or right angle Falk Motoreducers in either the All-Motor or Integral design. A foldout section bound into the middle of the book contains illustrated information on mounting positions, low speed shaft connections, and product features, together with pictures of typical applications. Falk Corp., Milkaukee, Wis. **(69)**

ENGINEERING SERVICES. Illustrated 12-page booklet, "Engineering Services," describes the services of the Engineering Division of Foster D. Snell, Inc. Activities described include: research for the development of new products; process development in the laboratory, pilot plant and semi-works; equipment design where standard equipment is not available; plant operation from start-up and until required; trouble-shooting for the improvement of operations; cost analyses for the most economical plant size and design; advisory services on technical and economic problems. **(70)**

SAFETY EDUCATION. The skeptical worker who wants to know what he stands to gain from working safely will get a ready answer from the National Safety Council's new employee training booklet, "What's In It For Me?" Illustrated in four colors, the booklet uses few words, but plenty of cartoons, to put across its message. For a sample copy and quantity prices circle No. 71 on card below. **(71)**

POLY-V DRIVES. Bulletin #2098 illustrating and describing the new Browning Poly-V drives is available from Browning Mfg. Co., Maysville, Ky. **(72)**

pH MEASUREMENT. Bulletin on complete instrumentation for pH measurement and automatic control, published by Bristol Co., Waterbury, Conn. contains drawings and photos of installations of pH recording and controlling instruments in such processes as copper and tungsten ore flotation, heavy media separation, ore preparation for electrolytic zinc, and the sodium dichromate treatment. Millmen should have this for sure. **(73)**

CHAIN DRIVE. A revised 16-page profusely illustrated catalog (C72-51) including new and expanded data on capacity ratings of Morse Hy-Vo high speed, heavy-duty chain drives is now available from Morse Chain Co., Detroit, Mich. **(74)**

SPECTROCHEMICAL ANALYSIS. Precision excitation unit for spectrochemical analysis, features and specifications of the De Luxe, Standard, the JAco Varisource is covered in an 8-page catalog No. V3-54. Special design features are described. Tables give relative qualities and parameter specifications of the five types of excitation circuits available. JAco Varisource is for use with prism or grating spectrographs of any make. Jarell-Ash Co., Newtonville, Mass. **(75)**

MOTOR WAGONS AND SCRAPERS. Mechanical and performance features of the Allis-Chalmers Models TS-200 and TS-300 motor scrapers, and of motor wagon models TR-200 and TW-300, are described in detail in two new catalogs now available from the company. In addition to specifications and other important data, the catalogs are illustrated with in-the-field photographs showing performance ability, versatility and efficiency. **(76)**

FUSES. Booklet No. 17-64 on Type CLF current-limiting fuses has been announced by General Electric's Construction Materials Division. Includes: Where and why these fuses should be used; construction details, ratings, dimensions; curves showing current-limiting characteristics and melting time-current characteristics for both 250v and 600v fuses. **(78)**

TORQUE LIMITERS. An 8-page, illustrated catalog (C14-54) describing Morse torque limiters; compact, adjustable slip-clutch devices that provide automatic over-load protection for machinery drives, is now available from Morse Chain Co., Detroit, Mich. **(79)**

ELECTRODES AND ELECTRODE ASSEMBLIES. Catalog describing "pH Electrodes and Electrodes for Measuring Redox Potentials—Assemblies, Parts and Accessories", has been published by Leeds & Northrup Co., Philadelphia, Pa. **(80)**

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to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

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1	8	15	22	29	36	43	50	57	64	71	78	85	92
2	9	16	23	30	37	44	51	58	65	72	79	86	93
3	10	17	24	31	38	45	52	59	66	73	80	87	94
4	11	18	25	32	39	46	53	60	67	74	81	88	95
5	12	19	26	33	40	47	54	61	68	75	82	89	96
6	13	20	27	34	41	48	55	62	69	76	83	90	97
7	14	21	28	35	42	49	56	63	70	77	84	91	98

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WHITEPRINTER. Colorful 4-page Bulletin No. 5405 describing the advanced design office-size Copymaster Whiteprinter tells how it efficiently and economically produces black line and colored line ammonia-dry whiteprints—continuously or intermittently—in office, plant or laboratory—at low cost. P&H Sales Corp., Chicago, Ill. **(81)**

FATTY ALCOHOLS. Not a bartender's guide but a booklet that tells how to use Cacholot brand cetyl, oleyl, and stearyl alcohols in various applications. Of particular interest is the use of these products in flotation. M. Michel and Co., Inc., New York 6, N. Y. **(82)**

ANTI-CORROSION COATING. A 4-page bulletin describes recently introduced Furan flexible coating. It is unplasticized and available in a limited range of colors. Application is similar to that required by vinyls but resistance to acids, alkalies and solvents is said to be materially greater. Carboline Co., St. Louis, Mo. **(83)**

AIR COMPRESSORS. Bulletin 125 representing three distinct types of air compressors has been released by Schramm, Inc., West Chester, Pa. Compressor buyers will find complete details, specifications and recommendations covering the Pneumapower, the self-propelled Pneumatractor and the Unistage models. **(84)**

FLOWSHEET STUDY. A comparison of initial and operating costs as well as tonnage of single-stage and two-stage grinding is given in Flowsheet No. M7-F29 published by Denver Equipment Company. Comparative flowsheets for 50 ton, 100 ton, 200 ton, 350 ton and 550 ton/24 hour plants, show both single and two-stage grinding. Denver Equipment Co., Denver, Colo. **(85)**

JAW CRUSHERS. New developments and improved features of design to increase efficiency and reduce operating costs are covered in a 48-page booklet on its broad line of overhead eccentric jaw crushers and 170 series stationary primary plants just published by Pioneer Engineering Works, Inc., Minneapolis, Minn. **(86)**

HOSE COUPLING. A quick connect-disconnect hose coupling for water, oil, steam, gas and chemical lines, which provides permanent freedom from leakage, is described in a bulletin just published by Titeflex, Inc., Springfield, Mass. **(87)**

GARDNER-DENVER LINE. Gardner-Denver Co., Quincy, Ill., has just introduced a compact catalog covering the complete line of Gardner-Denver pumps, compressors, rock drills and pneumatic equipment widely used throughout construction, mining, petroleum and general industry. **(88)**

CENTRIFUGAL PUMP FUNDAMENTALS. Ingersoll-Rand, New York, N. Y., has available an interesting and instructive booklet on "Centrifugal Pump Fundamentals." This 12-page form is written in simple language and illustrated with easily understood diagrams. It should be useful to all pump operators and installation and maintenance men as it explains the principles of operation, defines the various terms used in pump calculations and works out typical pump problems. **(89)**

ORE DRESSING REAGENTS. "Mineral Dressing Notes" (Bulletin No. 20), from American Cyanamid Co., New York, N. Y., describes properties and applications of various Cyanamid chemicals used in ore beneficiation plants and processes. Contains sections describing floating practice of various metallic ores, and a summary of flotation methods, used for treatment of various non-metallic flotation chemicals, and a selected flotation bibliography are also included. **(90)**

PLUG VALVE. New 24-page Reference Book No. 39-5 shows Homestead lubricated plug valve in full-port and venturi types, sizes up to 14 in. with a choice of self-sealed two-piece plug or one-piece plug designs. Engineering information includes principal dimensions, types of control, metals, lubricants, etc. Homestead Valve Mfg. Co., Coraopolis, Pa. **(91)**

GRAVITY CONCENTRATION. "Denver-Wilfley Concentrating Tables," Bulletin No. T1-B3, published by Denver Equipment Co., Denver, Colo., explains how tables are used to treat materials subject to gravity concentration. Data describing several models, including a laboratory model, include specifications and facts about the capacity and operation of the concentrating tables as well as their application in the flowsheet. Table construction is described in detail. **(92)**

SCREW CONVEYORS. Industrial Division of Continental Gin Co., Brimingham, Ala., announced a new screw conveyor catalog and engineering data book number ID-541. Included are various sizes and types of conveyors fully illustrated with photographs, line drawings and dimensions. Engineering data guides the user in the proper selection by size and type of conveyor and accessories. Tables and engineering data are also included for determining the proper speeds and horsepower **(93)**

TEMPERATURE CONTROL. Burling Instrument Co., Chatham, N. J., has issued Bulletin 103, describing their line of temperature controls. Covers the Models B-1C and B-1X, for controlling temperatures, or as high or low temperature safety alarms and cut-outs up to 100 deg F. **(94)**

RUGGED MATERIAL. In this booklet you will find up-to-the-minute facts about "Cordura" a rugged, durable fiber, with a tensile strength equivalent to 70,000 psi, which is being used for conveyor belts, heavy-duty, off-the-road tires; water hose, drain hose, steam hose and air hose, and V-belts in many mines and quarries. E. I. duPont de Nemours & Co., Wilmington, Del. **(95)**

ALLLOY STEEL. Outlined in a leaflet on "Jalloy, Grade 3", a special alloy steel for heavy duty use, made by Jones & Laughlin Steel Corp., Pittsburgh. Pa., are properties, composition, applications, case histories, and information on heat treatment of this steel for optimum results. **(96)**

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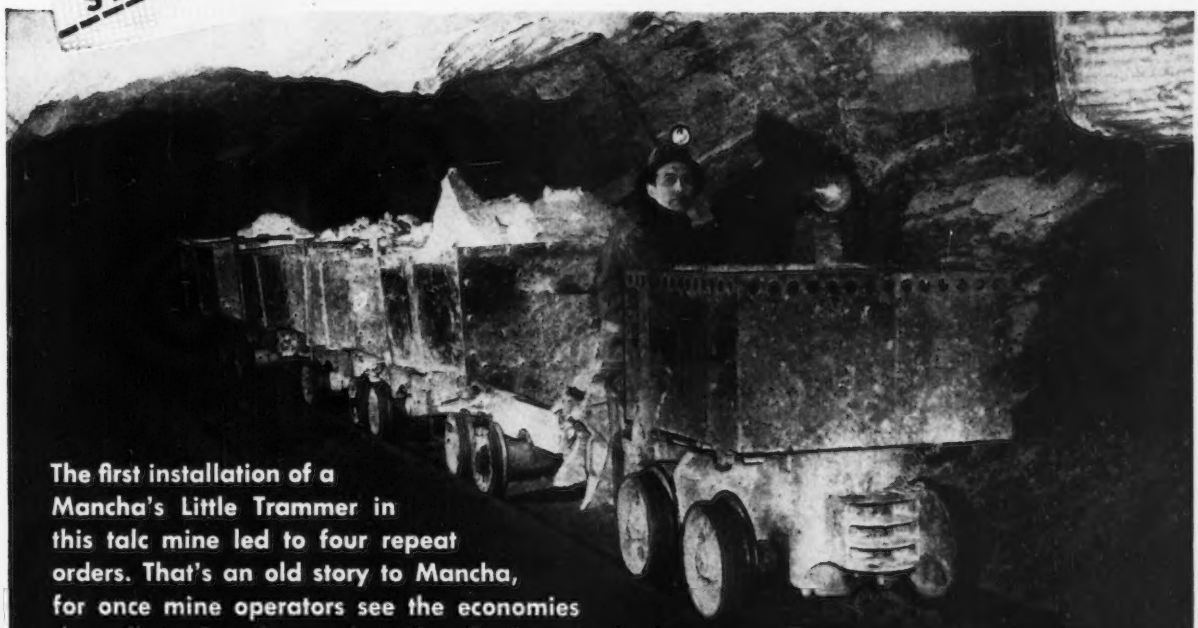
LITTLE TRAMMER

A powerful 1½ ton storage battery locomotive known the world over for profitable haulage.



The first installation of a Mancha's Little Trammer in this talc mine led to four repeat orders. That's an old story to Mancha, for once mine operators see the economies they effect when they replace slow haulage methods with a Mancha's Little Trammer, they want to further increase those savings by putting *more* Mancha's to work, on a *variety* of haulage jobs.

Small enough for work in narrow, crooked drifts, powerful enough for difficult working conditions, Mancha's Little Trammer will perform profitably in your mine . . . for haulage duty, for moving mucking machines and drill jumbos, timber and supplies, or man trips to distant workings.

Will Mancha's Little Trammer pay in your mine?

Whether or not you are in the market for new haulage equipment

YOU CAN HAVE THE ANSWER NOW!

Mail the coupon today for our "mine haulage questionnaire." Return it to us with your answers and we will tell you how our Little Trammer will save you money as it does daily for scores of operators.

Mancha builds a complete line of storage battery locomotives. If the Little Trammer does not fully meet your job requirements we will recommend a locomotive that does.

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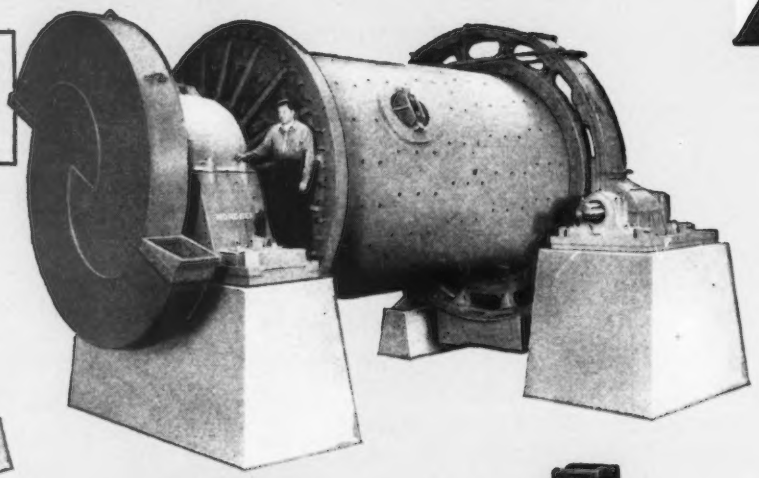
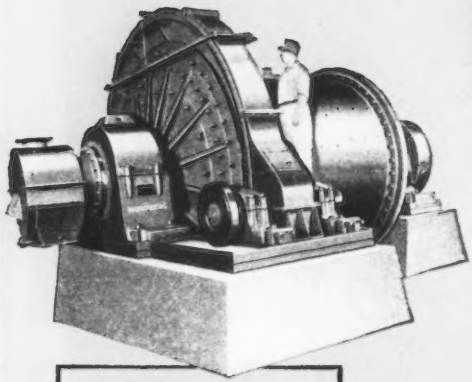
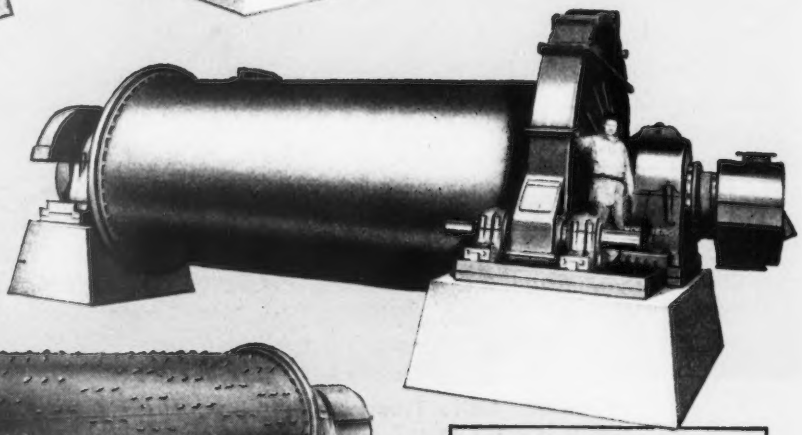
NORDBERG GRINDING MILLS

NORDBERG 10'-8" x 17' Wet Grinding Mill showing scoop feeder.

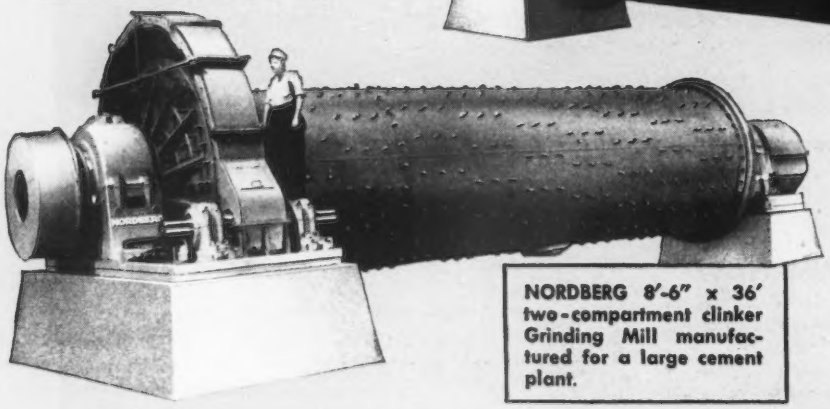




NORDBERG 9'-6" diameter x 11' long Dry Grinding Mill.



NORDBERG 9'-6" x 24' Wet Grinding Pebble Mill for non-ferrous milling.



NORDBERG 8'-6" x 36' two-compartment clinker Grinding Mill manufactured for a large cement plant.

NORDBERG MFG. CO.
Milwaukee, Wisconsin

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M453

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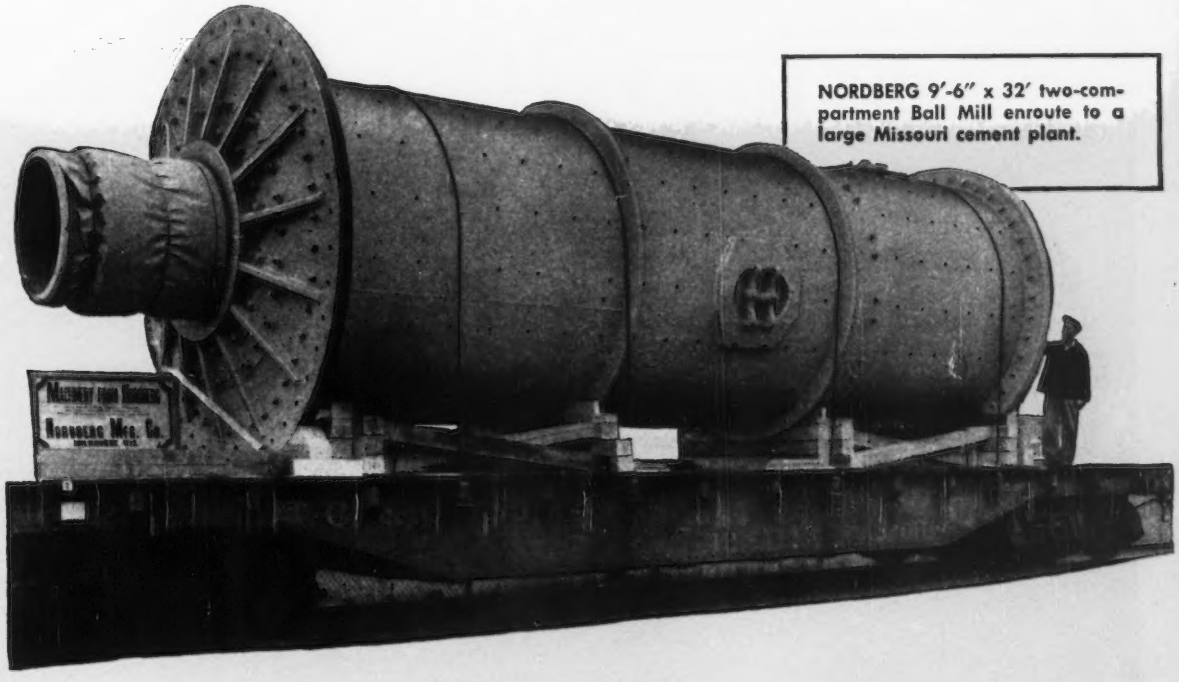
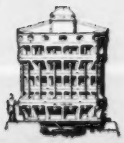
Competent engineering services are available for new processing plant design or modernization of existing plants.

For large or small operations, you can depend on Nordberg Machinery to deliver maximum output at lowest possible cost.



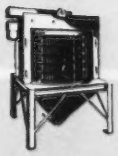
NORDBERG 9′-6″ x 32′ two-compartment Ball Mill enroute to a large Missouri cement plant.



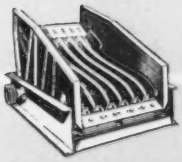
SYMONS GYRATORY CRUSHERS

SYMONS CONE CRUSHERS

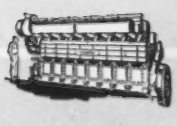
ROTARY KILNS and COOLERS



SYMONS "V" SCREENS



SYMONS VIBRATING GRIZZLIES and SCREENS

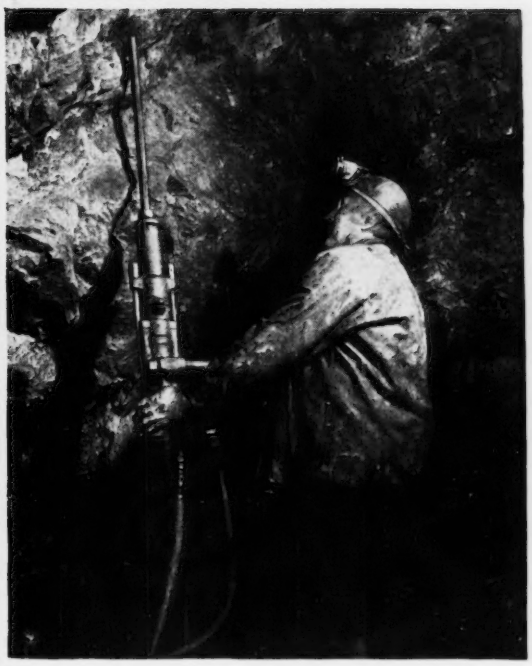


DIESEL ENGINES — 10 to over 10,000 hp

Ideal for Softer Rock Formations – the new CP-555 Rotauger's fast, powerful rotary drilling motor and its entirely independent rotary feed motor combine to more than double your footage in the softer formations. And its short overall length permits set-up in restricted quarters. Available for wet or dry drilling, it drills 2½ inch holes in speeds of 2 to 4 feet per minute to depths of 100 feet or more.

See Us at Booth 1210 and 1214 at The Mining Show.

Whatever the job— there's a CP to drill it!



Ideal for All Overhead Drilling—the well-balanced CP-34 Stoper gets more advance every raise round. Because it has just the right piston speed, foot-pound blow, rotating speed and feed pressure it gets the most service and footage out of Tungsten Carbide Bits. A ratchet-type twist throttle on the holding handle affords fine control of feed-leg pressure. Button that provides instant safety release for feed-leg pressure is standard; rotation release optional.

Ideal for Tungsten Carbide Bit Efficiency—the CP Airleg takes constant recoil shock in its stride—holds drill firmly to the work. Exclusive pressure release type control handle maintains a pressure balance that compensates for line pressure variations and changes in rock formations . . . the steady bit pressure that results prevents "slapping" and minimizes bit breakage. Available with steel or aluminum alloy feed cylinder and with 36″ and 48″ feed travel.

The CP Airleg makes an ideal combination when teamed up with CP-32A and CP-59 Sinker Drills. The valve design of CP Sinker Drills maintains high drilling speed and economy of air. Fully cushioned for low maintenance, they're available for wet or dry drilling.

Chicago Pneumatic 8 East 44th Street, New York 17, N. Y.

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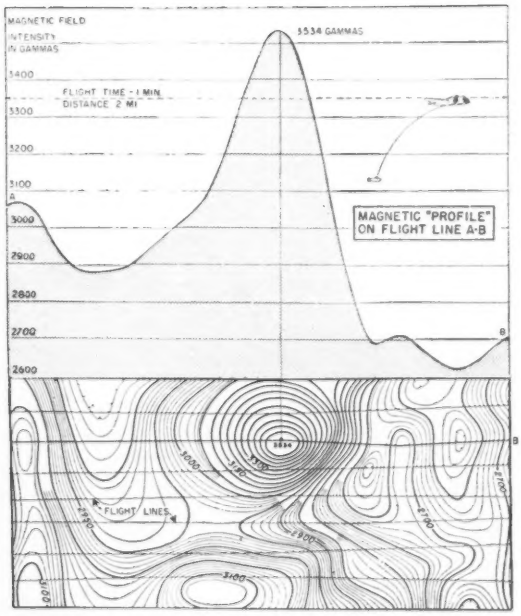
Airborne Magnetometer at work near Johannesburg

New Aerial Methods can in Exploration and



Profile of an ore body

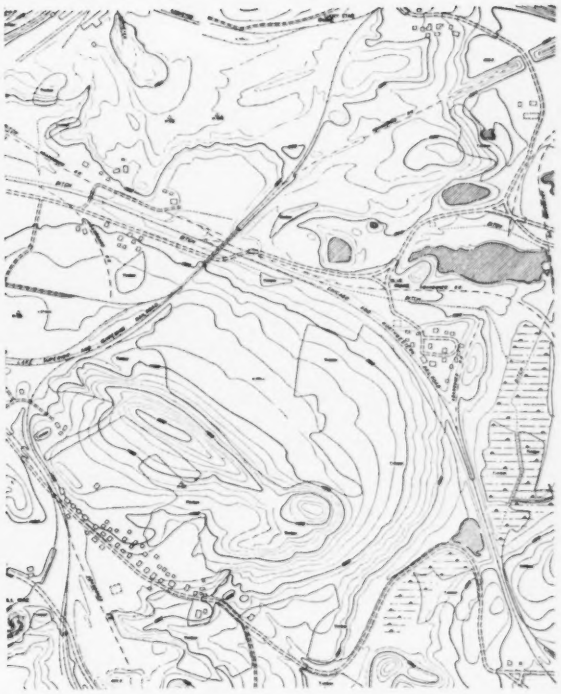
The high hopes that mineral exploration would be greatly aided by the airborne magnetometer have been realized. Pay-off finds are being made, often in blind areas. And mining engineers are speeding the planning and development for these and other areas with photo-reconnaissance and aerial topographic maps.

The most important new aid to mining exploration today is the airborne magnetometer. With it AERO is helping to uncover major new mineral finds in the United States, Canada, South America and Africa. A typical recent discovery was a massive magnetite body, at a depth of about 2,000 ft., with no surface expression. It was located through an aeromagnetic survey of 900,000 acres in eastern Pennsylvania, flown in 30 days. In Canada, the airborne magnetometer revealed another large magnetite body near Marmora and deposits in Labrador and other areas.

Magnetic peaks such as this, over an iron ore deposit, are recorded by the airborne magnetometer. Major finds of iron, nickel, titanium, and asbestos have been made with the aid of the flying magnetometer.

Photo-maps for reconnaissance ... topo maps to speed engineering plans

Swift, low-cost reconnaissance is obtained with air photos. They are useful for geologic study—and as photo-maps for plotting property lines and bore holes, locating spoil dumps, and other planning.



Richly detailed, dependable topographic maps are compiled by aerial methods at a fraction of the cost and time for ground surveys. They are used for all types of engineering planning.

save time and money Development programs

AERO's experienced crews have aided the search for nickel, titanium, asbestos, iron, and other minerals. Exploration costs usually are only a few cents per acre. In a number of cases, the magnetic data was so direct and positive that claims parties were dispatched within 24 hours after the survey flights. In fact, the magnetic data often is so revealing that large mining companies find it to be worthwhile for their chief geologists to go into the field with the air survey group. At the advance base they evaluate and act upon the aeromagnetic data as it is collected day by day.

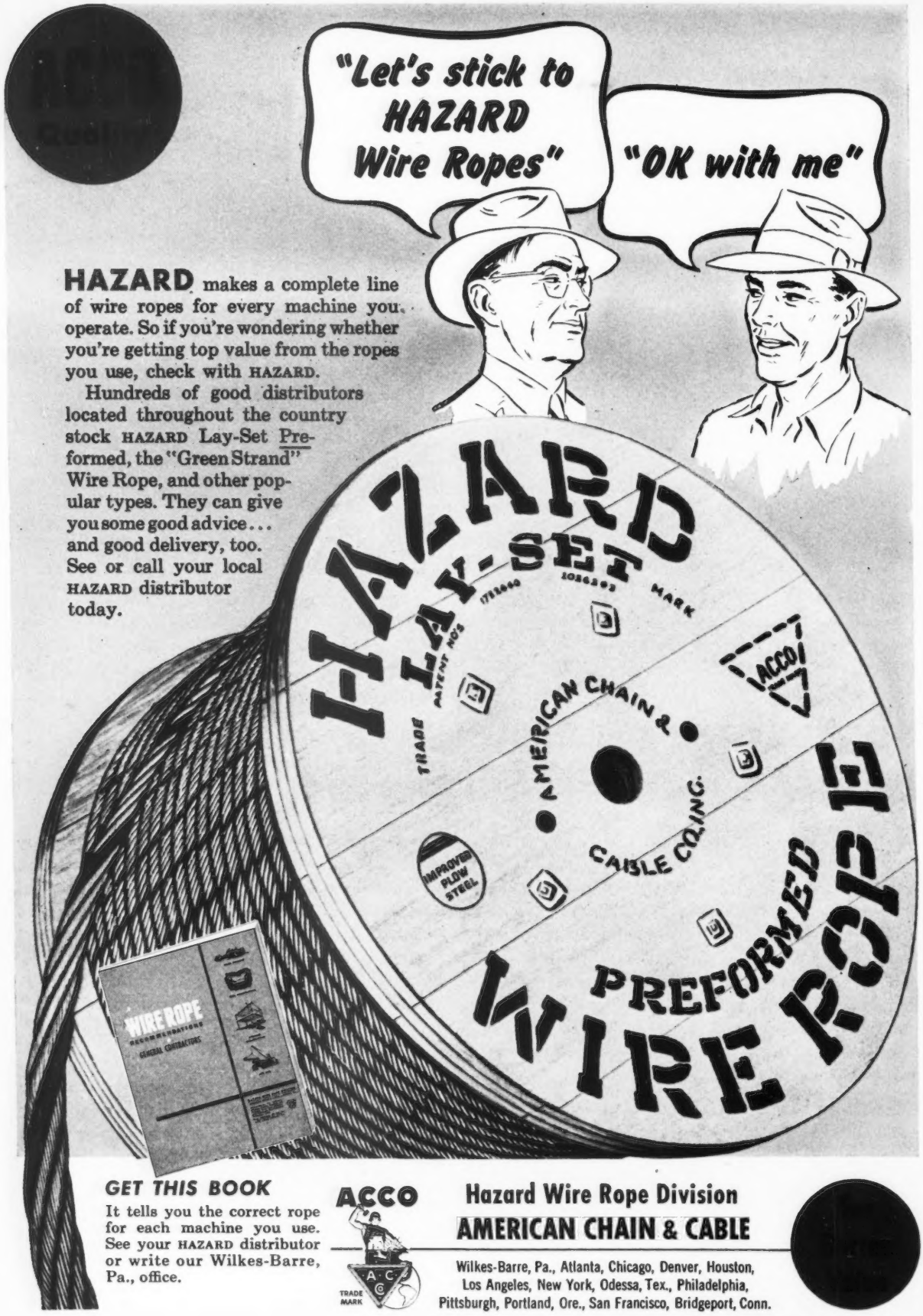
Supplementing the airborne magnetometer is another aerial survey tool—the mapping camera. At low cost it rapidly collects information about surface geology. The air photos are compiled in photomaps, which are used for broad exploration planning, to plot property lines and bore holes, to locate spoil dumps and reclamation areas, and for general planning.

AERO topographic maps further speed the mining engineer's planning. These maps are compiled at one-half of the cost and time of ground surveys (*or less*). They aid in the location of access roads, rail spurs, town sites, harbor facilities, and help with other development planning. AERO'S maps are so dependable they are used to estimate cut and fill for earthwork bids. Recent typical assignment: mapping Cerro Bolivar—2 meter contours, and scale of 1:1000. The maps will be used for engineering planning and management discussions.

These tested new aerial methods are especially valuable in first stages of mining exploration or development, when time and manpower saved can so greatly advance the date when actual mining operations begin. Our 35 years experience in exploration and mapping will be helpful to you.

AERO SERVICE CORPORATION
PHILADELPHIA 20

Oldest Flying Corporation in the World, whose crews are at work all over the globe on airborne magnetometer surveys, photo-maps, topographic maps, relief models and Shoran-controlled mapping.



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Hundreds of good distributors located throughout the country stock HAZARD Lay-Set Preformed, the "Green Strand" Wire Rope, and other popular types. They can give you some good advice... and good delivery, too. See or call your local HAZARD distributor today.

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An important message concerning a new —and unique— alloy steel

UNITED STATES STEEL is pleased to announce to all steel consumers a new steel which we feel sure will enable you to improve the performance, lengthen the life, and reduce the cost of industrial equipment. This new engineering material is USS Carilloy T-1 steel, which recently underwent some very severe testing in Birmingham, Alabama.

The development of T-1 steel began back in 1947, when our research people took a good look at a problem that had plagued alloy plate steel users for years. That problem was the multiplicity of compositions required to do everyday jobs. There was no one composition available that could serve a wide variety of applications—so our research people set out to develop such a steel. The steel we wanted had to possess many unusual attributes such as very high strength, unusual toughness, good weldability and excellent resistance to impact abrasion at temperatures from minus 150°F. up to as high as 900°F.

Today such a steel is a reality. It is USS Carilloy T-1 steel, which has been tested thoroughly, both in the laboratory and in actual service applications. To prove further the capabilities of this new Carilloy steel, Chicago Bridge & Iron Company and United States Steel this summer carried out a joint testing program on commercial pressure vessels built from T-1 steel. The results of these tests and their significance to all steel users are described on the next three pages. We feel sure that you will find the story well worth reading.

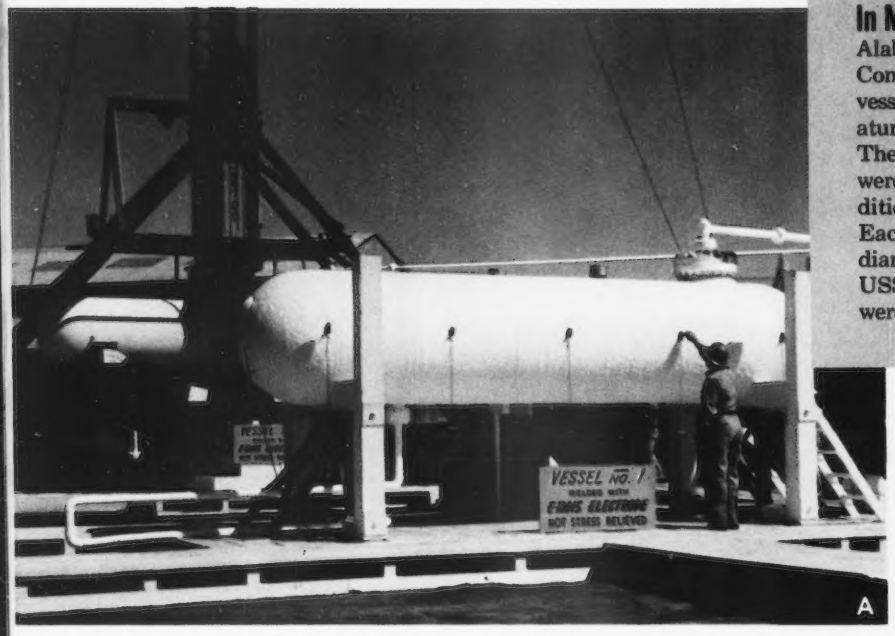
USS TRADE MARK

UNITED STATES STEEL

Remarkable new engineering material

PROVES SUPER-TOUGH

In May and June, 1954, at the Birmingham, Alabama, plant of Chicago Bridge & Iron Company, eight welded cylindrical pressure vessels were refrigerated to subzero temperatures and deliberately tested to destruction. The vessels were all standard designs that were built under normal production-line conditions by Chicago Bridge & Iron Company. Each vessel was twenty feet long, four feet in diameter, and made of half-inch plates of USS Carilloy T-1 steel. Four of the vessels were welded without stress relieving, using



A

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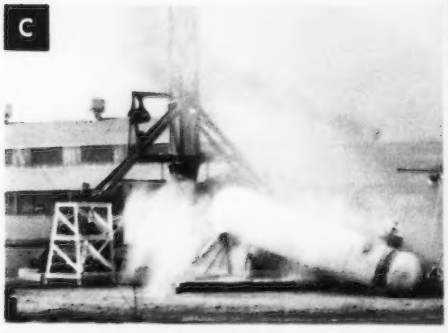


In pressure test at 38°F. below zero T-1 steel withstands stresses 3 times its design strength

This vessel, not stress relieved, was refrigerated to −45°F. Then, with a quarter inch of white frost clinging to its sides, a high pressure pump slowly chugged the pressure in the vessel up to 938 psi. At that point, the steel itself was stressed to 45,000 psi., which is one half the yield strength of T-1 steel.

The hydraulic pressure was forced still higher, to 1875 psi. At this pressure, the stress in the steel had reached 90,000 psi.—the full *nominal* yield strength. Still, every inch of the metal was sound and all welds were intact.

Now the test really came. The pump labored on, and the pressure climbed to 2,000 psi. . . . to 2500 . . . to 2850 psi. . . . then . . .

BOOM! A jet of yellow brine burst out of the vessel and shot 200 feet through the air. The vessel finally failed at a pressure of 2850 psi. and a minimum stress of 136,000 psi. on the plates. This stress is well over three times the design strength of 45,000 psi.

The temperature of the steel at the time of failure was a frigid 38 below, yet the metal showed no sign of brittle failure. Super-tough USS Carilloy T-1 did what no ordinary steel could do at such a low temperature—it stayed *tough and ductile;* in fact it actually stopped the tear from propagating any further through the vessel.

USS

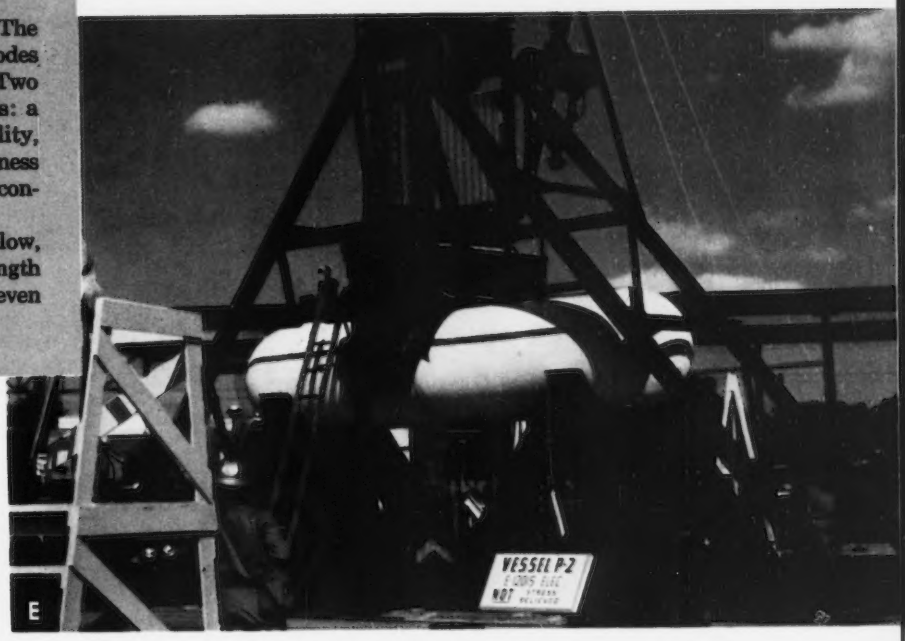
UNITED STATES STEEL

USS CARILLOY T-1 STEEL

DOWN TO 38°F. BELOW ZERO

E 12015 low hydrogen coated electrodes. The other four were welded with E 9015 electrodes and were stress relieved after welding. Two vessels of each type were given two tests: a pressure burst test for strength and ductility, and an impact punishment test for toughness and resistance to the most severe impact conditions that could be devised.

Results of these tests, described below, prove conclusively the exceptional strength and toughness of USS Carilloy T-1 steel, even at temperatures far below freezing.



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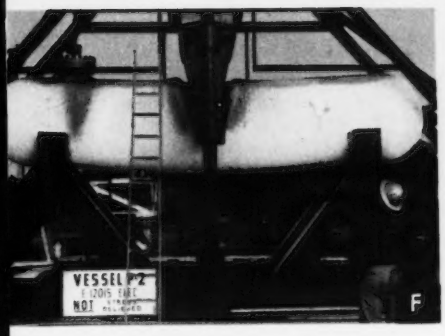

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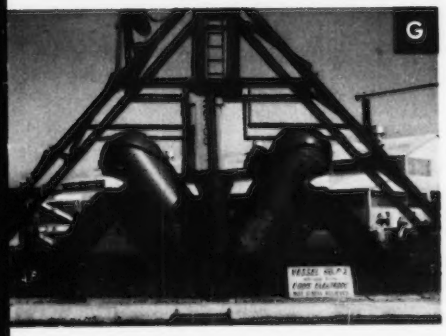
G

H

Frozen steel vessel made of Carilloy T-1 survives blow from 13-ton ingot dropped 73 ft.

A steel ingot weighing 26,700 lbs. has just plummeted 52 feet and crunched on top of this test vessel (Fig. E). The ingot was traveling 39 miles per hour when it hit. It struck with an impact energy of about 1,400,000 ft. lbs., bounced fifteen feet, and crushed down again on top of the vessel.

This vessel was welded without stress relieving. It was refrigerated to 33° F. below zero. It was pressurized to 1,875 psi. equal to a stress on the plates of 90,000 psi.—the steel's *nominal* yield strength. Yet, it did not fail. The ingot left only a 7/16 inch dent in the top, with a slight bulge on either side of the dent.

The test was repeated (Fig. F). This time the ingot was raised 73 feet, then dropped. It pounded down again on the very same spot on top of the vessel. Traveling at 46.7 miles per hour, it hit with an impact blow of 1,960,000 ft. lbs. The dent merely deepened – the steel and all welds were still intact.

Again the test was repeated (Fig. G). Now dropped from 101 feet, the 13-ton ingot ploughed into the top of the vessel at a speed of 55 miles per hour, hit with an impact of 2,750,000 ft. lbs. This time the vessel failed. But it didn't shatter. It didn't crack. It tore open like a tough piece of hickory. In other words, it failed without any signs of brittleness, even though the temperature of the steel was now minus 22° F.

In addition to this tremendous resistance to impact abuse, combined with remarkable sub-zero toughness, Carilloy T-1 steel also gives you excellent resistance to impact abrasion . . . good high temperature strength . . . and exceptional weldability.

Turn the page to see how you can use this remarkable new steel to cut costs and improve performance in a great variety of products.

You can use USS Carilloy T-1 steel in excavating and mining equipment to reduce costs and improve performance

The impact and burst tests, described on the previous pages, demonstrate that Carilloy T-1 steel is remarkably strong and tough, and capable of absorbing impact abuse without expensive, time-consuming breakdowns. That's just what you need in heavy-duty power shovels, bulldozers, draglines . . . in ore cars, chutes, hoppers, and conveyors. It enables you to reduce weight, or increase payload, or multiply service life. Many times you can accomplish all three, just by replacing parts or redesigning with Carilloy T-1 steel.

And don't forget, you save a lot of money on fabrication and repair when you use T-1 steel. You can flame cut it or weld it right out in the field without expensive preheating or stress relieving.

In actual service, Carilloy T-1 has proved its ability to last up to nine times as long as ordinary carbon steels. It has far better resistance to the scouring of rock, ore, coke, sinter and other abrasive materials. And it can be used *the year round* in all kinds of weather because it stays tough and durable at sub-zero temperatures—where ordinary steels crack and fail. Send the coupon for complete information about this amazing new steel, and be sure to see the T-1 exhibit at the American Mining Congress in San Francisco.

PAYLOAD INCREASED 28% WITH T-1 STEEL. The dipper stick, bail, and bucket of this big electric shovel are fabricated of T-1 steel plate. The superior strength and durability of Carilloy T-1 made it possible to increase the capacity of the bucket from 35 to 45 cu. yds.

SEE FOR YOURSELF WHAT T-1 CAN DO FOR YOU

Visit the
United States Steel Booth
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☐ Please send me your booklet "United States Steel presents T-1" which contains the full story of T-1 steel.

☐ Have your representative get in touch with me.

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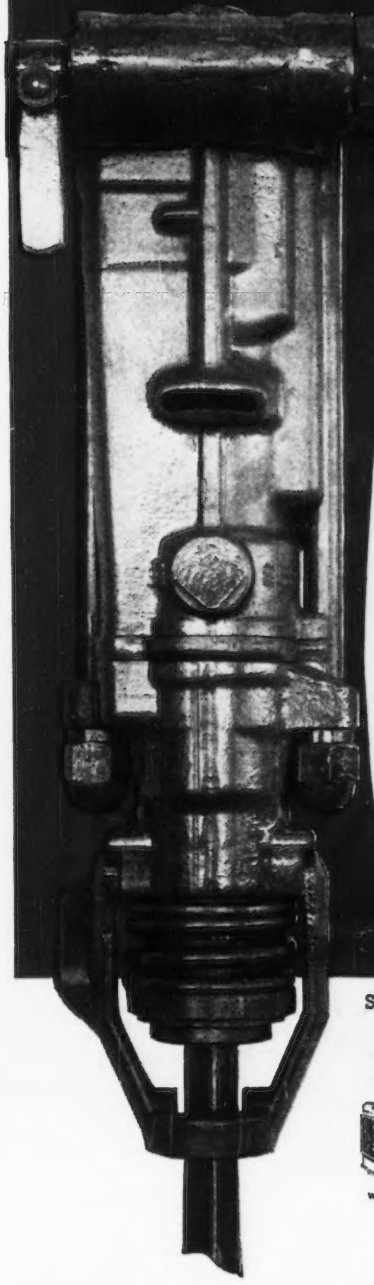
UNITED STATES STEEL

GARDNER-DENVER ANNOUNCES

THE NEW S58 SINKER!



new! the medium-weight sinker that's quickly changed from wet to dry . . . to automatic wet.

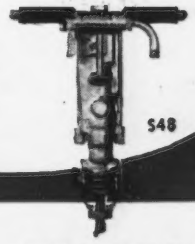
new! automatic valve for fast drilling . . . easy holding.

new! full swiveling water connection.

new! large-area water screen and self-cleaning air system.

new! steel puller easily operated . . . simple to maintain.

The NEW MODEL S58 is a brother to the famous GARDNER-DENVER S48— the lightweight sinker that's already a favorite for fast, low-cost drilling.



S48

SINCE 1859

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THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

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for copper converter linings . .

These carefully controlled refractories are made from the best quality raw materials, are formed under high pressure and are fired extremely hard. Dependable workmanship and uniformity are assured.

In addition, Harbison-Walker produces various other classes of basic refractories for every metallurgical furnace need.

®

HARBISON-WALKER

provides Two service-proved basic refractories

• Chromex B

Briefly summarized, the desirable properties which account for the excellent service secured with this extra hard fired chrome-magnesite refractory are:—high density and impermeability—relatively low thermal expansion and good resistance to thermal shock—unusual stability and high strength at high temperatures.

• H-W Magnesite

For the most strongly basic linings this refractory with the magnesia content of over 90% fulfills the most severe requirements. It is fired at an extremely high temperature and is dense, strong and volume stable at temperatures far above the highest employed in copper converters.

HARBISON-WALKER REFRACTORIES COMPANY

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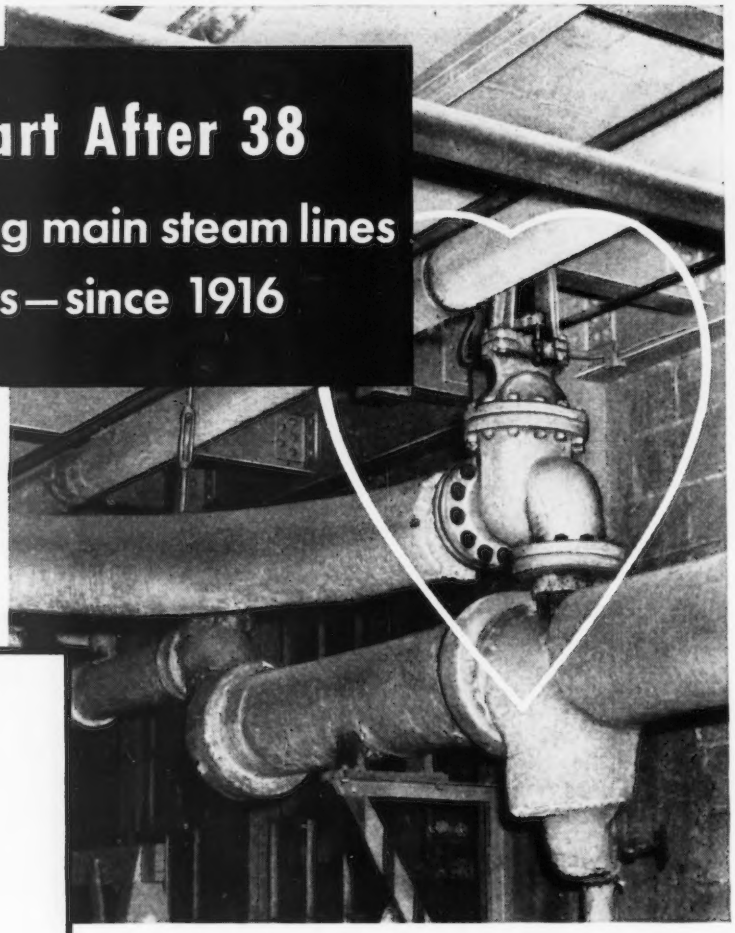
General Offices: Pittsburgh 22, Pennsylvania

World's Largest Producer of Refractories

Young at Heart After 38

Crane valves policing main steam lines with no repairs—since 1916



The Installation

In the Lehigh Portland Cement Co. plant at Oglesby, Ill. Original installation of 6- and 3-inch Crane steel valves in boiler-to-turbine steam piping. Working pressure: 160 pounds at about 475 deg. F.

Valve Service Ratings

SUITABILITY:
Hard to Beat

MAINTENANCE COST:
Not a penny for repairs

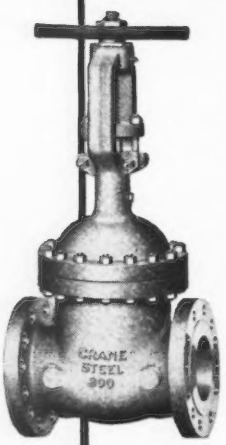
SERVICE LIFE:
38 yr.—still O. K.

OPERATING RESULTS:
Lowest cost steam control

AVAILABILITY:
Complete Crane line of modern patterns

The Valve

Like their 1916 counterpart designs, modern Crane Steel Valves give you performance that wins preference in every industry. They give you the values of steady leadership in steel casting . . . quality design . . . precise manufacturing. And the range of the Crane line in pressure classes, materials, and patterns, meets every need. See your No. 53 catalog, or your Crane Representative.



The Case History

Never, since installed in 1916, have these Crane valves been out of service for repairs. Only care given—and good care, obviously—is prompt repacking of the stuffing box and lubrication when needed. Such attention usually includes a general clean-up.

Neither infrequent operation nor the non-lubricating properties of steam have troubled these valves. They respond to the handwheel with smooth, positive action. High wear-resistance in seating materials keeps them tight as new, year after year.

Buying quality valves from the start assured this amazingly low-cost main line steam control. Today this buying policy is more justifiable than ever. And today as in 1916, better quality valves mean Crane valves.

THE BETTER QUALITY... BIGGER VALUE LINE... IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Uranium Exploration on the Colorado Plateau!

From the beginning of the current spectacular uranium developments in Colorado, Utah and other adjoining states, Sprague & Henwood, Inc. has placed its equipment and personnel, fully and competently, at the disposal of both Government agencies and private mining interests.

As a result of this prompt action, backed by a 60-year record of world-wide experience, we have been awarded contracts for many thousands of linear feet of

DIAMOND CORE DRILLING

much of which has already been successfully completed.

At present we are busily engaged but, having moved many of our best operators and drilling rigs into the area, are prepared to handle new core-drilling contracts promptly and efficiently.

A new branch office and shop has been established on the Fruita Highway, near Grand Junction, Colorado, to help provide the best possible service throughout the Western Uranium Field. For quick action 'phone Robert R. Carver, Manager, at Grand Junction 834. He knows the answers to most drilling problems—through personal experience.

A Sprague & Henwood Contract Core Drilling Rig in the Western Uranium Field.

Sprague & Henwood, Inc.

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Manufacturers, also, of High-Speed Core Drilling Machines, "Oriented Diamond Bits" and complete accessory equipment for Core Drilling and Soil Sampling. Illustrated bulletins containing complete information mailed on request.

The Sun never sets on Sprague & Henwood's Contract Diamond Core Drilling Operations

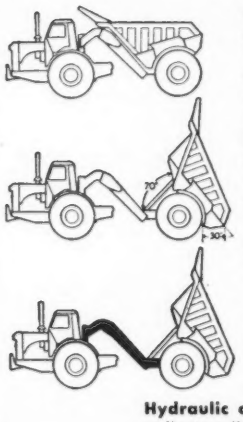
Four TR-200's work up to 460 hours a month . . . average only 4 hours down time

In less than a year, the George W. Kerford Quarry Company, Atchison, Kansas, put 3,828 hours of work time on each of their four Allis-Chalmers TR-200 Rock Wagons. They piled up 460 hours a month over one five-month period. During the year, service down time for each unit averaged only 4 hours a month . . . this means that each rock wagon was on the job over 98 percent of working time!

The TR-200's have been hauling quarry stone from the pit to a crushing plant 1½ miles away. Loads average 16 tons and each cycle is completed in 14 min. Fuel consumption has been about 3¼ gal per hour with no oil needed between changes.

George E. Kerford states, "We like the TR's maneuverability and easy control, which makes it possible for any good truck driver to learn to drive the outfit quickly. The wagon body is well constructed and cleans easily and completely. We find that most parts needing frequent maintenance and repair are easily accessible."

HERE ARE THE FEATURES BEHIND THIS OUTSTANDING RECORD



Big bowl top makes excellent target for shovel or dragline operator, helps loading under bins or chutes.

High power-to-load ratio of 16 hp per yard of capacity speeds hauling, helps on steep grades.

Maximum lift angle of 70 degrees speeds dumping of any type material. Big opening and "bathtub" design slide loads out fast at minimum dump angles.

Dumps 30 in. back of rear wheels to put entire load over banks or into hoppers.

Wheel base stays fixed during dumping cycle for greater safety on banks, accuracy in spotting loads.

Four-wheel air brakes allow full control, safer dumping over banks.

Hydraulic control system raises or lowers bowl while traveling, gets TR-200 into position sooner.

176 hp engine — 5 speeds forward to 21.6 mph, reverse 2.5 — 11 yd struck, 15 yd heaped, 18 tons

Write for complete catalogs or ask your Allis-Chalmers dealer for a demonstration

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

J&L's New JALTEN series enables you to select low-alloy, high-strength steel in the following combinations of advantages:

[redacted] High strength, good formability and fabricating —good resistance to low temperature impact.

[redacted] High strength, moderate forming—improved resistance to atmospheric corrosion.

[redacted] High strength—improved resistance to abrasion.

Remember to specify JALTEN High Tensile Steel for

- **HIGH STRENGTH • RESISTANCE TO CORROSION**
- **GOOD FORMABILITY • RESISTANCE TO ABRASION**

[redacted]

Jones & Laughlin
STEEL CORPORATION – *Pittsburgh*

The data you want is in this book:

- Chemical Properties of Jalten
- Mechanical Properties of Jalten
- Jalten Equivalents
- Jalten Application Data

Jones & Laughlin Steel Corporation
Dept. 412, 3 Gateway Center, Pittsburgh 30, Pa.

Please forward a copy of your booklet, Jalten low-alloy, high-strength steel.

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Company_____

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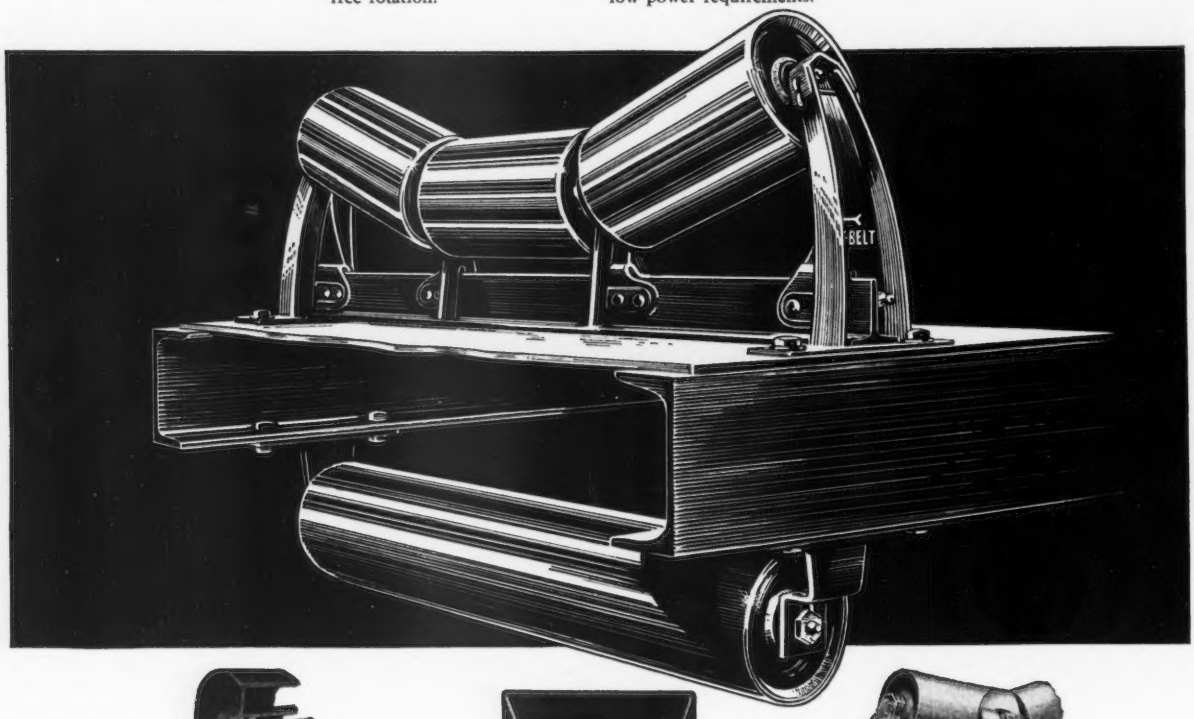
7 solid reasons why it pays to standardize on LINK-BELT IDLERS

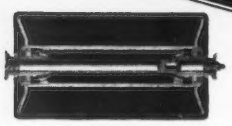
1 STRONG, RIGID FRAMES support rolls in perfect alignment. Rolls are securely held in place but can be easily removed for inspection and service.

2 CONCENTRIC ROLLS have smooth surfaces and rounded edges. Machine-made, continuous welds prevent entrance of dirt and moisture—assure hop-free rotation.

3 HUSKY, HIGHEST QUALITY BEARINGS, free and easy turning, provide concentricity and perfect alignment for smooth operation, minimum belt wear, low power requirements.

4 SAFE, CONVENIENT GREASE FITTINGS provide ease of lubrication. Extensions can be furnished for greater accessibility in out-of-the-way locations.





5 POSITIVE, COMBINATION GREASE SEAL unit retains lubricant, prolongs bearing life. The most effective seal offered in idlers today!

6 ROLLS consist of a counterbored outer shell plus a full-length, heavy central tube of 3/16-in. steel. Both tube and shell are welded to dished steel heads to maintain balance and bearing alignment.

7 HEX NUTS provide bearing adjustment at shaft ends and prevent rotation in service. Nuts prevent bracket from spreading under unusual impact.

Get the right idler from industry's most comprehensive line

Link-Belt makes more than 500 belt conveyor idlers in 34 types. You can select from light, medium or heavy-duty 20° troughing idlers, two types of 45° idlers, flat belt, belt training, rubber cushion and the new Link-Belt variable troughing idler. Most are built in a broad range of roll diameters and belt widths with matching return idlers. Ask your Link-Belt sales representative or distributor for new 48-page Book 2416.

LINK-BELT

BELT CONVEYOR IDLERS

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13.415

TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

ROTATING SEAL on the motor shaft will not attract fine taconite dust, helps keep out dirt.

NEW SEALING COMPOUND applied on the rabbet fits helps keep dust from vital motor parts.

TEXTOLITE* FAN cannot be clogged by magnetic taconite dust—resists acids and alkalis.

DUST-PROOF gasket adds protection. Big conduit box, numbered leads ease maintenance.

Built even for taconite's toughest processes . . .

G-E TRI 55 CLAD enclosed motor keeps out dust, dirt and grit!

General Electric's all-new Tri-Clad '55' enclosed motor is better sealed against dirt, grit and magnetic dust. That's why it's the ideal workhorse for difficult jobs such as taconite screening, classifying, filtering, magnetic cobbering and magnetic separating.

Here are some of the protection features that add to the life of this new motor. Cast iron end shields and frame have tightly sealed rabbet fits. A non-magnetic seal is on the motor shaft to keep fine dust out of the bearing housing. A rubber gasket protects lead entry to the stator; conduit box is also gasketed.

This protection naturally suits the Tri-Clad '55' motor to tough applications throughout mining industries. For hazardous locations, G-E Bureau of Mines approved motors are the correct choice.

General Electric Tri-Clad '55' motors are now available in many ratings. The complete line of 1 to 30 hp a-c motors will be available soon. For full details contact your G-E Apparatus Sales Office or G-E Motor Supplier today. Write for Tri-Clad '55' bulletins GEA-6012—Enclosed motors, GEA-6013—Dripproof motors, GEA-6027—Gearmotors. General Electric Company, Section 648-10, Schenectady 5, N. Y.

*Reg. trade-mark of General Electric Co.

Progress is our most important product

GENERAL ELECTRIC

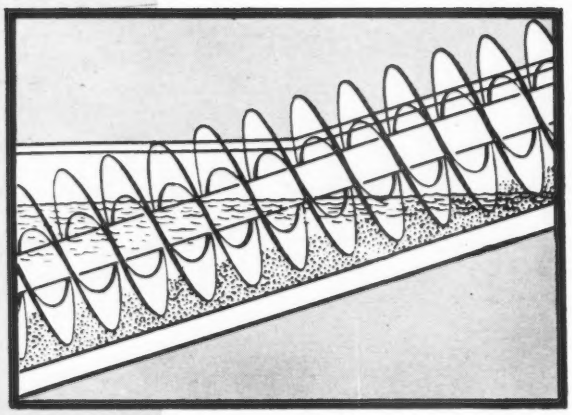
how

AKINS

leadership in mechanical performance can help you cut costs

Classifiers and heavy media separators are selected on the basis of low-cost-per-ton output resulting from efficient, dependable mechanical and metallurgical performance. That's why so many successful mining companies throughout the world continue to order *and reorder* Akins.

for example...



the main shaft

- the rugged Akins main shaft, with greater wall thickness than ordinary classifiers, is designed to permit using a smaller diameter shaft... to obtain maximum metallurgical efficiency. It results in larger active pool and provides for adequate space between the shaft and the flights to obtain the proper drainage of fines necessary for a quiet pool and efficient classification — thus, low-cost-per-ton production.

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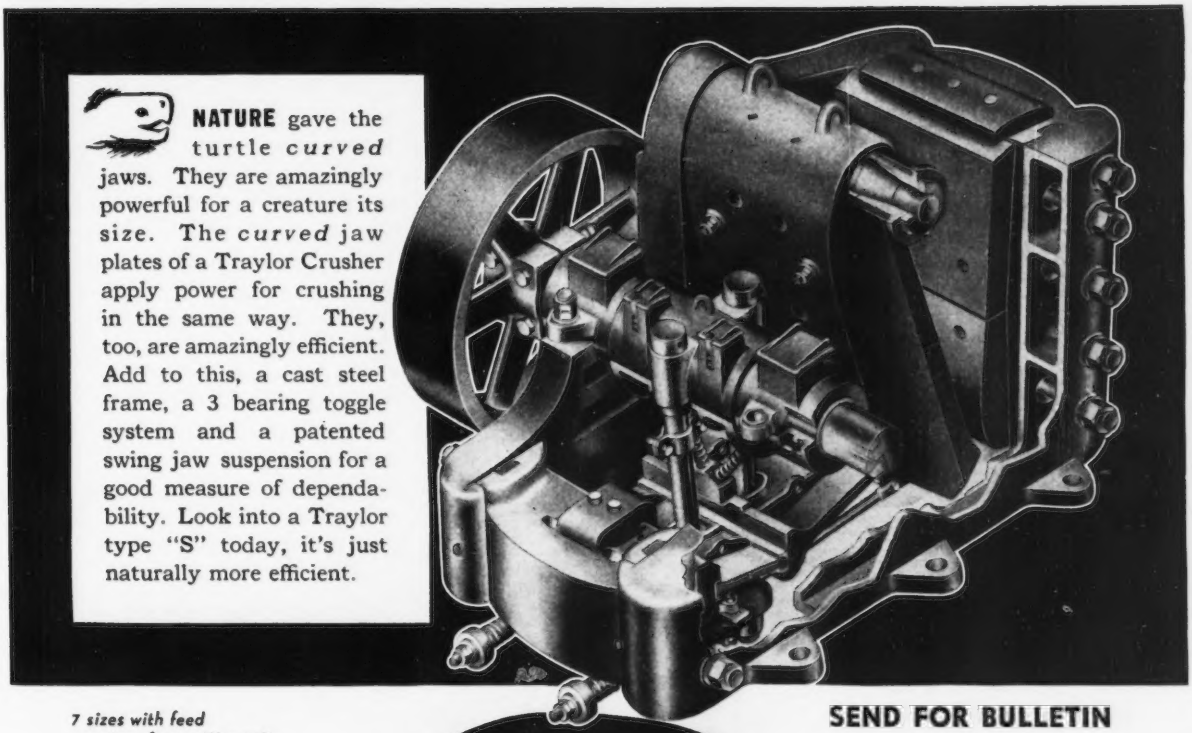
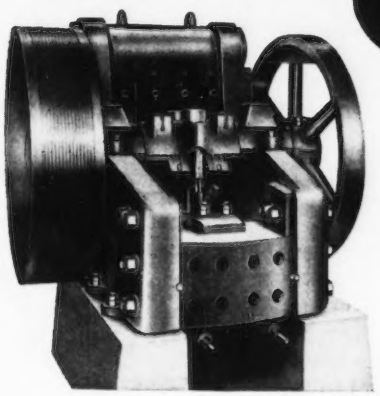
efficiency

Comes "NATURAL" With a TRAYLOR "S" JAW CRUSHER



NATURE gave the turtle *curved* jaws. They are amazingly powerful for a creature its size. The *curved* jaw plates of a Traylor Crusher apply power for crushing in the same way. They, too, are amazingly efficient. Add to this, a cast steel frame, a 3 bearing toggle system and a patented swing jaw suspension for a good measure of dependability. Look into a Traylor type "S" today, it's just naturally more efficient.

7 sizes with feed openings from 36" x 42" to 60" x 84".



A **Traylor** LEADS TO GREATER PROFITS

SEND FOR BULLETIN
that gives all the facts

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Sales Offices: New York • Chicago • San Francisco
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P.Q.

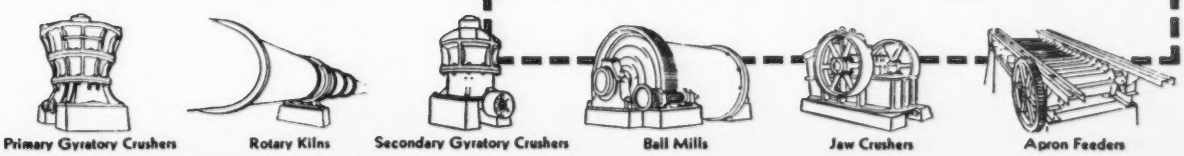
NATURALLY I'm interested in knowing more about the production efficiency of the Traylor "S" Jaw Crusher.

*Name*_____

*Company*_____

*Address*_____

*I'm now crushing*_____*tons per hour with a*_____*crusher.*



Primary Gyratory Crushers | Rotary Kilns | Secondary Gyratory Crushers | Ball Mills | Jaw Crushers | Apron Feeders

DISASSEMBLED SECTOR of a disc showing the Stainless Steel nuts and clamps, tie rods, radial rods and drainage nipple.

DISC FILTER in operation at the Rifle plant of U. S. Vanadium Company. Through the sludge can be seen the Stainless Steel nuts and clamps which hold the filter cloth on the sectors and hold the sectors in place. Drainage nipples in the center, the center shaft, piping and the automatic valve at the left are all Stainless Steel.

Stainless Steel helps filter discs handle acidulous uranium sludge

● Stainless Steel's superior corrosion resistance and long life has brought it a number of highly important assignments in processing uranium and vanadium ore at the Rifle, Colo., plant of U. S. Vanadium Company, a division of Union Carbide and Carbon Corp.

One location where Stainless Steel has given highly satisfactory performance is on the disc filters handling a sulphuric acid sludge. On the discs themselves, the discharge nipple, the top portion of each sector, the nuts and clamps on the disc rim, and the horizontal knives are Stainless Steel.

Stainless Steel also is the material used for the internal parts of the automatic valve that controls vacuum and pressure to the individual disc sectors. Pipe fittings here are Stainless Steel, too.

Stainless Steel's unique combination of properties — smooth, dense surface, long life, corrosion and abrasion resistance, ease of cleaning and low maintenance — fit it for a wide variety of jobs in mining and ore processing. Investigate its possibilities in your operations. And when you use it, be sure you get perfected, service-tested USS Stainless Steel.

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COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · NATIONAL TUBE DIVISION, PITTSBURGH
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PIPE · TUBES · WIRE
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4-1832

UNITED STATES STEEL

today—it's a bigger catch with MUSCLES OF STEEL

Five billion pounds of fish yearly. It's a catch that would make the oldtime Gloucester fisherman gasp—yet it's all in the day's work for America's modern fishing industry. And it's a job that couldn't be handled without the aid of *muscles of steel*—indispensable wire rope.

Whether off the Newfoundland Banks, along the Gulf Coast, or in the waters of the Pacific, powerful winch-equipped trawlers depend on Wickwire Rope to haul in their heavily laden nets.

On landlubber assignments, too, Wickwire Rope has a vital role in helping American industry do a better and more efficient job. In the oil fields and the logging camps. In the mines and the quarries. On construction and highway projects. In numerous and varied materials handling operations. On all of these jobs, Wickwire Rope consistently demonstrates its ability to deliver performance that is unrivalled for long-lasting economy and reliability.

every industry benefits from wire rope

WICKWIRE ROPE

CF&I PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

2534

Here's motor superiority

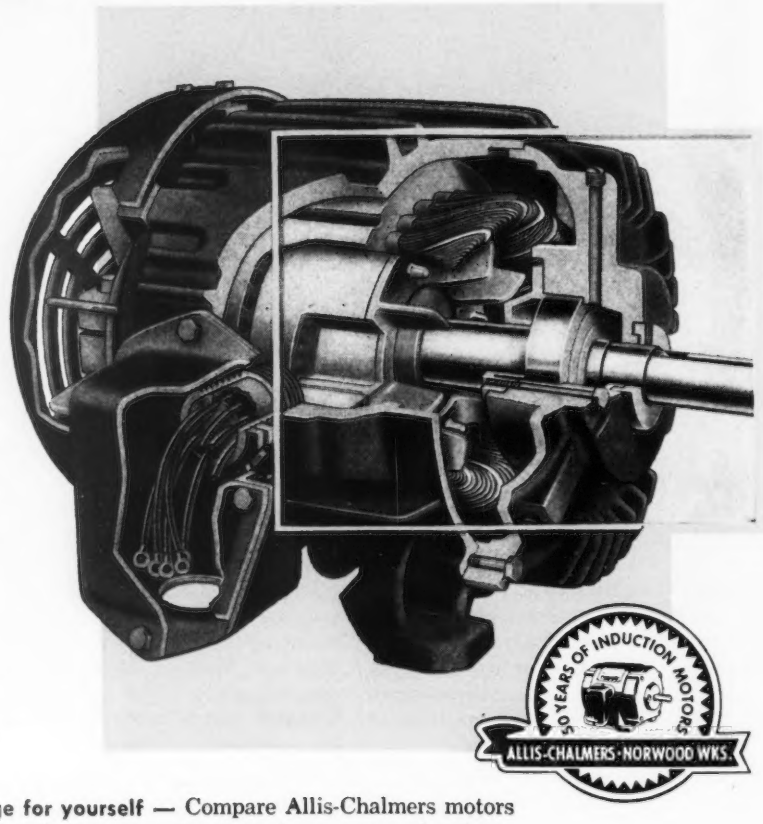
you can see

It takes 6 bolts not just 4 to give full bearing protection

THE TWO EXTRA BOLTS in the end housing of every Allis-Chalmers ball bearing motor are the proof of *extra* protection against bearing failure. These are the bolts that hold the bearing cap tightly in place against the inner face of the bearing enclosure. This cap, with its close running clearances, keeps grease from the interior of the motor . . . retains an ample supply within the bearing enclosure . . . protects the grease and the bearing against contamination from dirt and moisture.

At the outer side of the bearing, double labyrinth seals keep grease in, also keep dirt out. What's more, large grease reservoirs act as additional dirt traps.

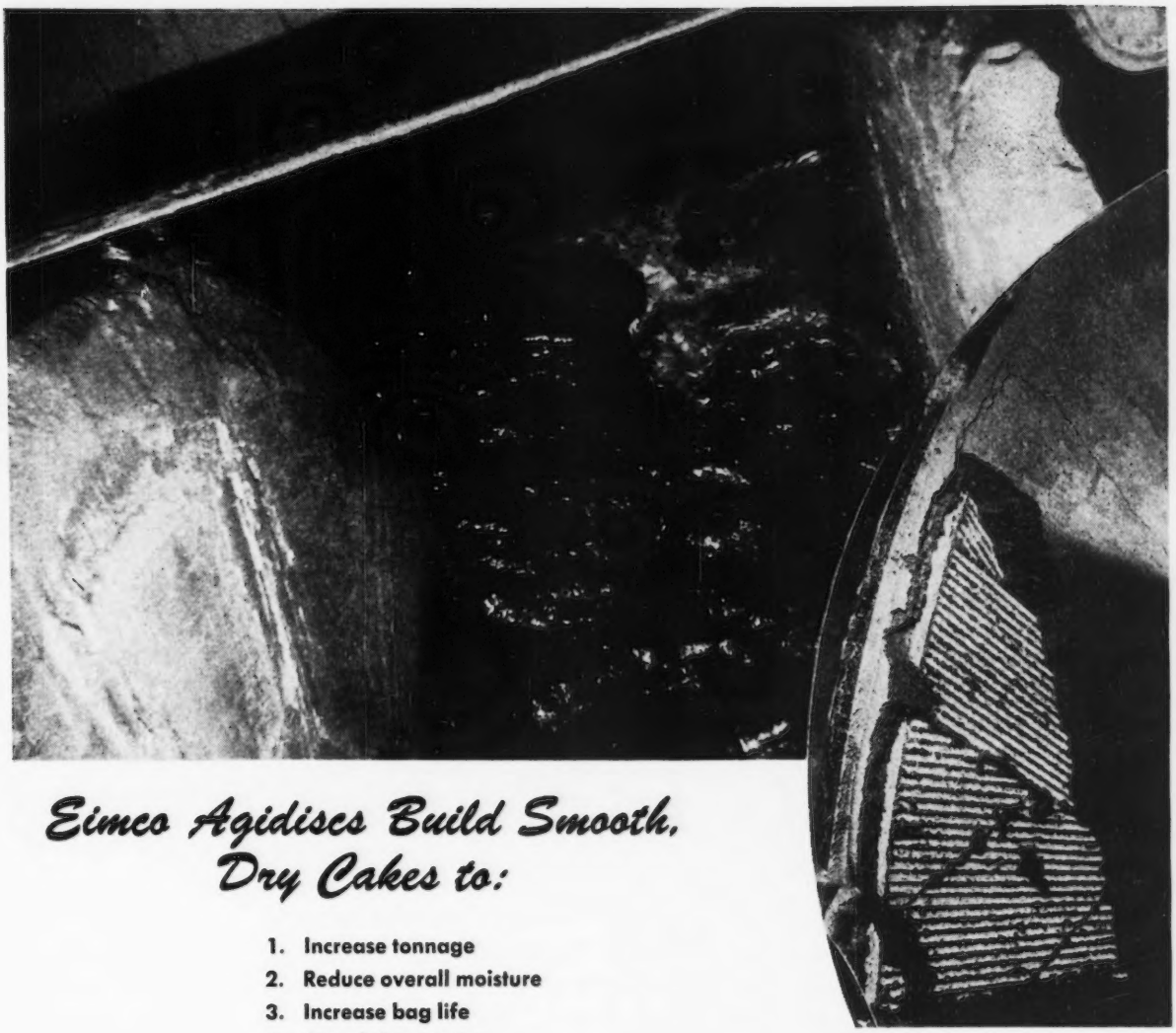
Result? Allis-Chalmers motors pay off in longer, trouble-free bearing life, lower motor maintenance.



Get all the facts . . . judge for yourself — Compare Allis-Chalmers motors with other motors. Get the six-bolt construction that gives you complete bearing protection. For proof, see your Allis-Chalmers Office or Authorized Distributor, or write — Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-4441



Eimco Agidiscs Build Smooth, Dry Cakes to:

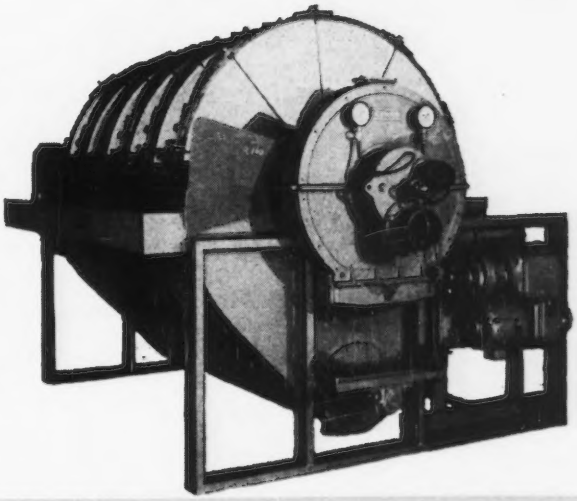
1. Increase tonnage
2. Reduce overall moisture
3. Increase bag life
4. Speed dewatering
5. Increase profits

Fast settling solids in metallurgical slurries are easily kept suspended in solution by the gentle agitating motion of the Eimco Agidisc filter.

This action, in the filter, evenly distributes all particles, regardless of size, so that the entire surface of the disc is covered with a cake of even thickness. Cake thus formed may be dewatered and dried uniformly so that there are no real wet spots or dry spots.

Metallurgical plants using Eimco Agidisc filters are enjoying greater capacity per square foot of filter area per hour (20% better) and lower moisture content in the cake.

Let an Eimco Engineer tell you how the Agidisc works. Whether or not it will make more money for you.



B-57

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

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BUCYRUS-ERIE 50-R

For the first time, the flexibility of Ward Leonard control is available in a rotary blast hole drill — the outstanding, new Bucyrus-Erie 50-R. This modern variable-voltage control gives the operator smooth instant command over rotation of the drill pipe. He can choose the most efficient speed for a given formation — can vary the speed as required without stopping the drilling operation. In hard formations with maximum down pressure exerted on the bit, the rotary drive will average about 40 RPM. In drilling softer materials, rotating speed can be increased substantially as down pressure is automatically reduced.

The flexibility of Ward Leonard control is also available on the 50-R for propelling, and for hoisting and lowering of the derrick machinery. It brings maximum efficiency and ease to these operations.

Ward Leonard control is only one of many outstanding 50-R features designed to save you time and money in your blast hole drilling operations. Get the complete story — write today! 10B54

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visit Booth 911. Our representatives there will be glad to give you full details on the outstanding 50-R.

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SOUTH MILWAUKEE, WISCONSIN

It's PENTAERYTHRITETETRANITRATE . . . and it shoots at four miles a second!

"20,350 feet, to be exact. That's *fast* — but not too fast to permit relief of burden. I lay out my shots so that front line holes go a fraction before succeeding lines. I get better fragmentation — easier digging.

"Another thing — I always use the *right* Primacord for the job. Primacord is made in three types:

Plain — for small bore or shallow holes and trunk lines.

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Wire Countered — for very deep, ragged holes, or with heavily reinforced explosives containers.

Plastic Reinforced — in river crossings, deep holes — or when field shots must stand a long time before blasting.

"I get good results every time because I always choose my Primacord as carefully as I use it."

P-11

See your explosives supplier or write for information to

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PRIMACORD® *detonating fuse*

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These Vacseal Pumps are destined for service in a variety of pumping applications. Some as difficult as pumping Iron Concentrates (65% solids) or Phosphoric Acid or highly abrasive Filter Acid Pulp. The list of users is long and varied and Vacseal's record is one of dependable on-the-job service delivering long term, trouble free performance in every type of pumping operation. Let us help you with your pumping problem. Write for catalog that gives full details on both Vertical and Standard Vacseal Pumps.

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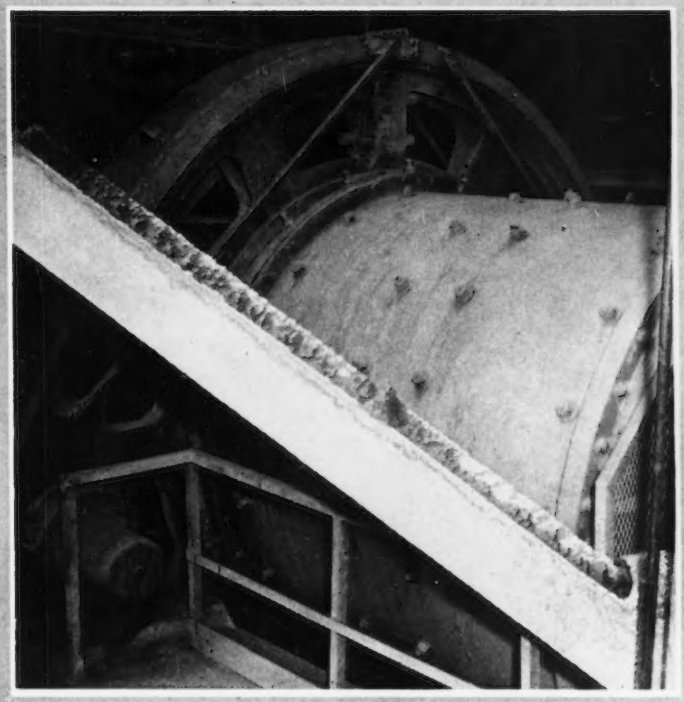
orphans



MARCY 86 BALL MILL...
BUILT IN 1915...STILL WORKING 24 HOURS PER DAY AFTER 40 YEARS OF DEPENDABLE MECHANICAL OPERATION...
M & S SUPPLIES QUALITY REPLACEMENT PARTS WHICH FIT ACCURATELY — FROM ORIGINAL DRAWINGS AND TEMPLATES.

You can ALWAYS get replacement parts that fit YOUR mill

When you buy a Marcy* Grate Discharge Ball Mill or a Marcy Open End Rod Mill you get a mill which is recognized as the leader in low-cost-per-ton output resulting from efficient, dependable mechanical and metallurgical performance—proved by the fact that so many successful mining companies continue to order *and reorder* Marcy Mills.

And, you are assured of always being able to get the same high quality replacement parts to *accurately fit your mill.* Templates and drawings are available for every Marcy Mill.

**Both Marcy and Massco are registered trademarks.*

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Offices in Salt Lake City, El Paso, 1775 Broadway, N. Y. C.

Deep in Chile's Santiago Valley is an excellent example of how rudimentary methods and equipment can achieve low cost-plus-tails . . . with the right reagents. 1

The flow scheme is this simple: Ore running 2% copper carried to the surface (photo 1) is crushed to minus two inches (photo 2) and spread in layers on the mill floor. Over each layer several soup cans of Cyanamid AEROFLOAT® 31 Promoter and AERO* Xanthate 301 are ladled and a dash of pine oil added. Then the batch is spaded and sliced (much as you hand-mix concrete) and shoveled into the Trapiche (photo 3). By adjusting the weir on the trough in which the steel-shod concrete wheels rotate and varying the pulp density, flotation feed overflows at minus 48 mesh to a battery of four roughers and two cleaners (photo 4). 2

At the head of the circuit a booster shot of AERO Xanthate 301 drip feeds through a nail hole in a can, while Sodium Sulfide is added to the last two roughers to float oxide ore. A three-man crew mills 10-12 tons a day. Though control assays are few and far between, smelter returns show a surprisingly high profit. 3

Small or Large... Cyanamid helps

Seven hundred miles north and 8,000 feet higher in the Andes is the mill pictured on the opposite page. It treats upwards of 20,000 tons per day of copper ore assaying substantially the same as the feed to the primitive 10-ton mill above. Though its methods and equipment are ultra modern, for maximum recovery it also uses an efficient reagent combination . . . Cyanamid AEROFLOAT 238 and Isopropyl Xanthate. 4

* Trade Mark

AMERICAN *Cyanamid* COMPANY

mills select the right reagents

At each of these mills a Cyanamid Field Engineer spent many, many hours helping to work out the best reagent set-up for the operating conditions. Whether your mill is large or small, a Cyanamid Field Engineer may be able to help you develop a better reagent combination for your ore on your mill.

Cyanamid offers a most complete line of flotation and cyanidation chemicals plus efficient processes for separation by specific-gravity differences. A nearby Cyanamid Field Engineer will welcome the opportunity to work with you to cut costs, increase recoveries or both.

MINERAL DRESSING DEPARTMENT 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

Open pit stripping at ANACONDA'S

LEVIATHAN MINE

The Anaconda Leviathan Mine Operating Plan calls for stripping 19,000,000 tons of overburden. Isbell men and equipment have moved 15,800,000 tons since June 1952, and are now stripping an average of 900,000 tons per month. In this and similar operations, the Isbell organization has moved over 216 million tons, with a team well trained and experienced in know-how.

ISBELL experience in open pit MINING

Isbell experience in volume earth moving and selective open pit mining is long established. Isbell teams have successfully mined or stripped copper, gold, lead, sulphur, manganese, tungsten, uranium, zinc, and non-metallics. Isbell has available the equipment, engineering, management, and operating personnel for jobs anywhere.

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ISBELL
CONSTRUCTION COMPANY

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol Multi-Service Oils

UNITS Compressors 14x12 / 9x12; 14x12 / 7½x12; 14x14 / 10x14

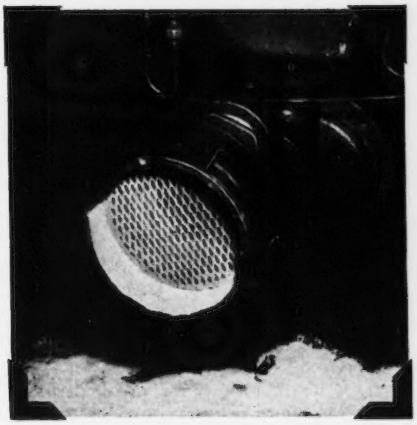
LUBRICATOR Force feed and crankcase

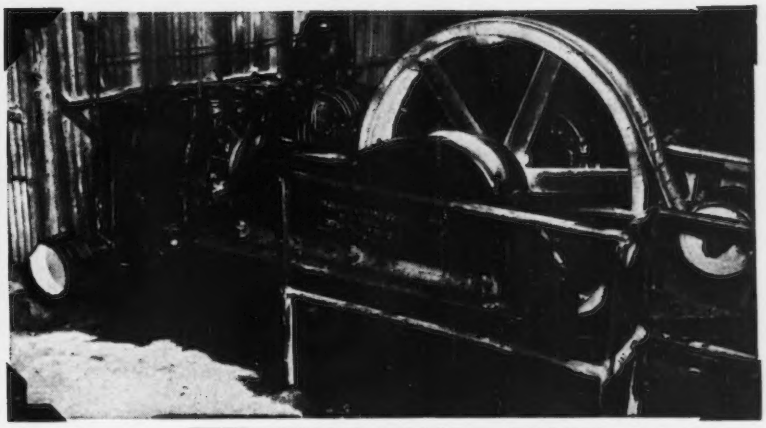
CONDITIONS Extreme dust conditions

PERIOD 7 years

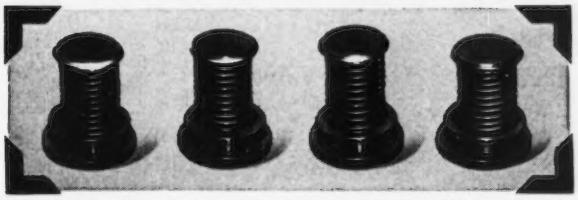
FIRM U. S. Lime Products Corp., Sonora, Calif.

Lime mine compressor rings still good after 7 years!





LUBRICATED WITH CALOL MULTI-SERVICE OIL 55X, this is one of three Ingersoll-Rand compressors that supply all air for the Sonora, Calif., mine of the U.S. Lime Products Corp. Heavy coating of lime dust on the air intake and floor indicates the extreme conditions under which the compressor works. Even so, when pistons were pulled for the first time after seven years, rings were found to have no deposits, ports and grooves were free and clean—and the entire assembly was returned to operation.



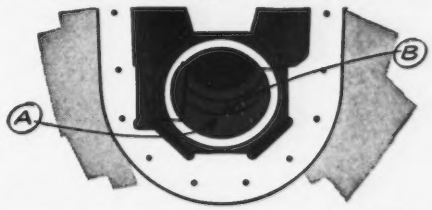
THESE VALVES, taken from the compressor's low side, get the first dust from the air intake. Note how they are free from all deposits.

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

Now CALOL Multi-Service Oil cuts costs in all types of compressors



In crankcase and on cylinders, Calol Multi-Service Oil reduces wear and oil consumption—has cut consumption 20% in air compressors.

A. Oxidation-resistant compounds prevent formation of varnish. Detergent keeps contaminants suspended in oil, prevents foam.

B. Special compound assures "hot-spot" lubrication...covers surfaces rapidly.

Calol Multi-Service Oils also recommended for pumps, diesel engines, enclosed gears.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

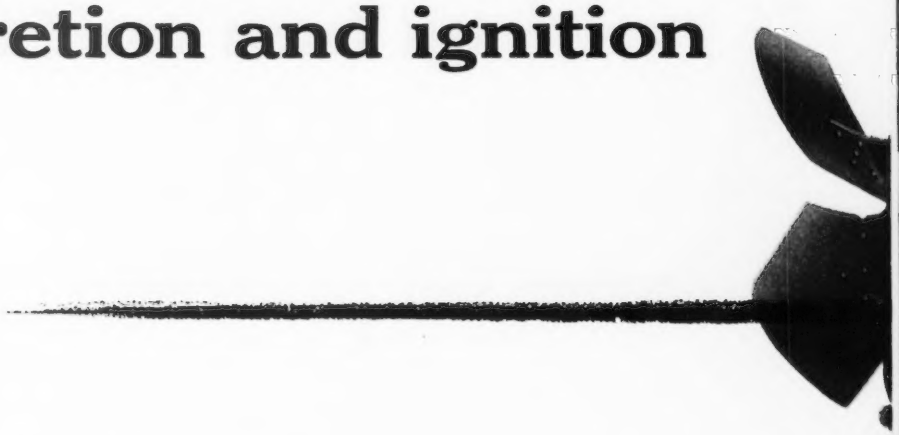
STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P.O. Box 862 • El Paso, Texas

Announcing...

revolutionary new diesel fuel system... as simple as gasoline carburetion and ignition



Exclusive PT Fuel System now standard on all Cummins Diesels

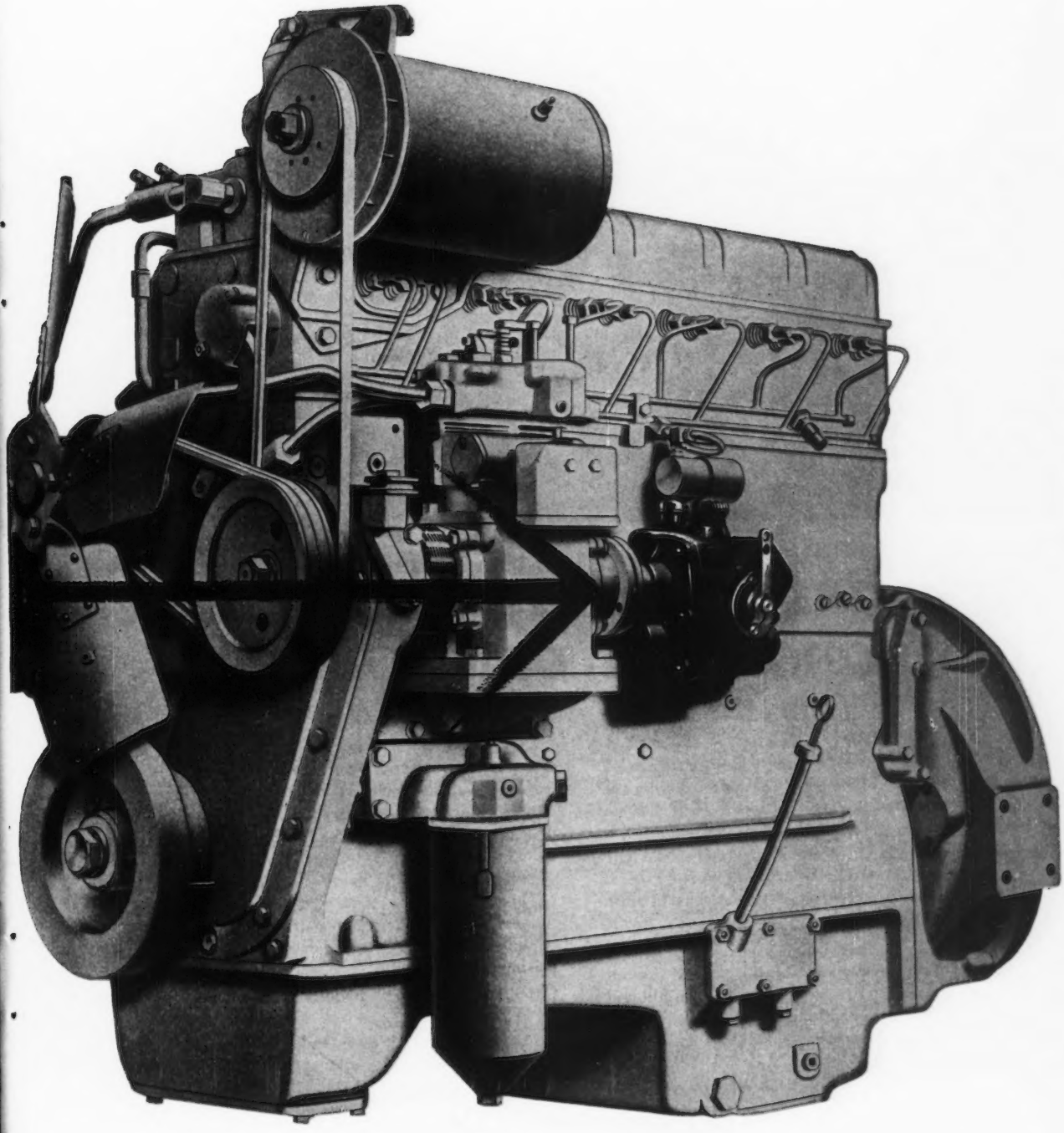
- Drastically reduces maintenance costs
- All mechanics can understand and service it
- Pump weighs only 13 pounds—system has no racks, check valves, metering plungers, discs, floats, etc.— does not have to be timed to engine
- Adaptable to all Cummins Diesels built since 1932

Write for your copy of descriptive folder "Cummins PT Fuel System."

CUMMINS **Cummins**

Engine Company, Inc., Columbus, Indiana

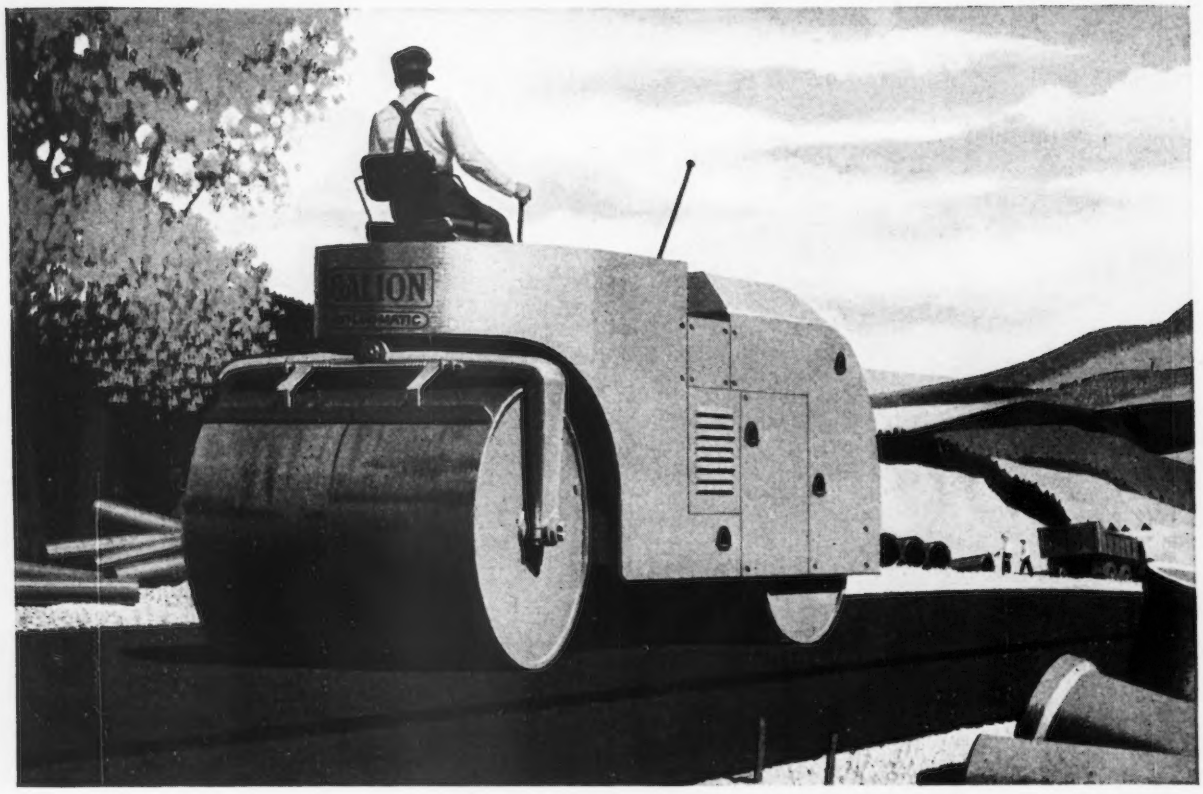
Leader in rugged, lightweight, high-speed diesels (60-600 h.p.)



Visit the Cummins Exhibit at the Mining Show!

Booth 430

See first-hand how simple the PT Pump is to assemble!



NEW GALION ROLL-O-MATIC WITH TORQMATIC CONVERTER

rolls 10% more surface per day

GALION — one of the world's largest manufacturers of road rollers—now offers four new gasoline-powered ROLL-O-MATIC tandem rollers equipped with Allison TORQMATIC Converters.

This efficient combination torque converter and fluid coupling makes ROLL-O-MATIC simpler to operate. It eliminates the master clutch. There are no gears to shift.

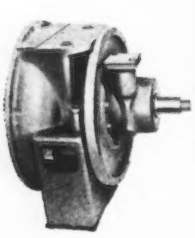
ROLL-O-MATIC rolls smoother in either direction. With the governor directly on the tailshaft it has quicker pickup —takes guesswork out of reversing. Rolling speed is automatically maintained up hill—on the level—down hill and on curves, by means of the combination of the TORQMATIC Converter and tailshaft governor.

The maker reports the operation is so smooth that at least 10% more surface can be rolled per day. And fuel consumption is reduced as much as 25%.

The applications of Allison TORQMATIC Converters are broadening rapidly. With units in a new range from 40 to 150 horsepower to fit both gasoline- or Diesel-powered engines, more than likely you, too, can gain the many moneysaving benefits of this drive. The completely *self-contained* converters are compact, easy to install and surprisingly low in price.

Check your equipment manufacturer or dealer or write us for full particulars.

ALLISON DIVISION OF GENERAL MOTORS
Box 894M, Indianapolis 6, Indiana



GM GENERAL MOTORS

Allison

TORQMATIC DRIVES

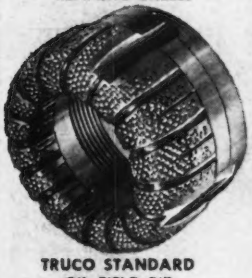
TRUCO CORING BIT

TRUCO CONCAVE BLAST HOLE BIT

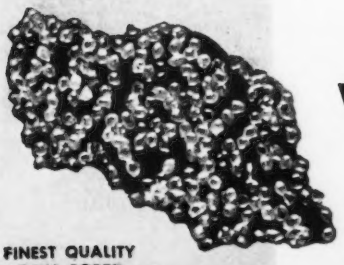
TRUCO PILOT BIT

TRUCO IMPREGNATED CORING BIT

TRUCO REAMING SHELLS



TRUCO STANDARD OIL FIELD BIT



FINEST QUALITY DRILL BORTZ

A Mountain of Light, and a Star

When the royal crown is placed upon a British monarch's head, the soft lights of Westminster Abbey dance upon some of the most beautiful jewels in existence, including two of the world's greatest diamonds—the Koh-i-noor and the Great Star of Africa.

The Koh-i-noor, or "Mountain of Light," was found four thousand years ago in the legendary diamond fields of the King of Golconda. War, conquest, torture, theft, assassination and barter brought it to princes, moguls, shahs and rajahs, and brought tragedy, too, so the legend says, except when it was worn by a woman. Originally it weighed 800 carats, but cutting has reduced it to 106½ and greatly increased its beauty. It adorns the front of the Queen's crown.

The Great Star of Africa, set into the top of the royal scepter, weighs 516½ carats and is the largest cut diamond in the world. The original stone weighed 3,025 carats (about a pound and a half) and although it was the largest diamond ever found, was, obviously, but part of a much larger stone, still undiscovered.

The Great Star came from Premier Mine No. 2 in South Africa which produces many of the fine diamonds used in Truco Diamond Bits. Positioned with "cutting edge to the work," these diamonds give Truco Diamond Bits their irresistible cutting power; their ability to penetrate any formation, swiftly, accurately, thriftily, dependably, lowering rig time and cutting footage costs. May we send you the Truco Diamond Bit Catalog?

TRUCO DIAMOND BITS

by

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue, Detroit 38, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada

"Today, the most fruitful prospecting is done in the laboratory—not in the field.

Develop a process to suit the ore,"

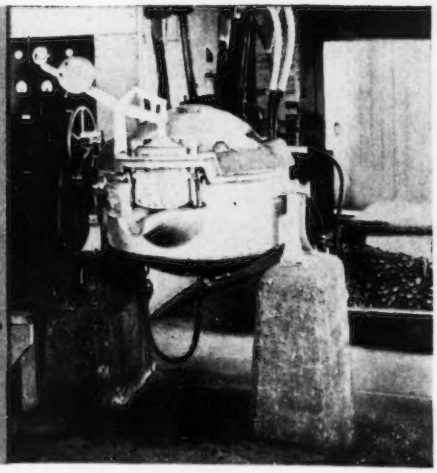
say Messrs. P. B. Dettmer, General Superintendent, and L. J. Lichty, Managing Director, of Cobalt Chemicals Limited, Cobalt, Ont.

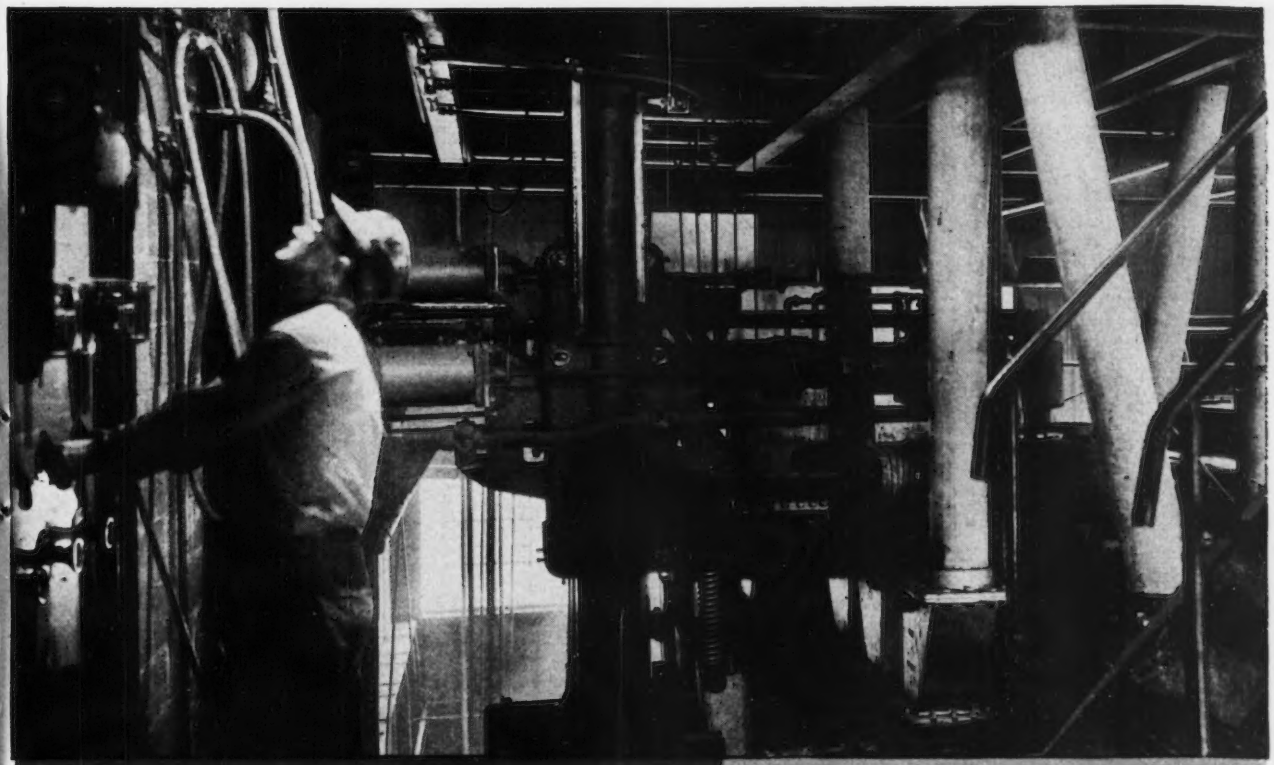
Quebec Metallurgical Industries, Ltd. followed exactly this policy in directing development work for Cobalt Chemicals Limited. Research and pilot plant operations were carried on at their Ottawa Laboratories. They resulted in establishment of the process now employed on a commercial basis for the treatment of arsenical silver-cobalt-nickel concentrates produced in the Cobalt area.

The 600 KVA. Smelter, shown on the opposite page, is now operating on a commercial basis at Cobalt Chemicals Limited. Concentrates, mixed with fluxes, are put through this furnace and smelted to matte; arsenious oxide is also produced as a valuable side product. The matte is ground, roasted, sulphated and leached, after which copper, nickel, cobalt and silver are selectively precipitated and reduced to metallic form.

The "work horse" during the initial experiments, when their chemists were formulating the process, was this 50 KW. Lectromelt® Furnace. Although unimpressive in appearance, it has the flexibility which enables researchers to proceed quickly and surely. It permits them to make a quick shift as a new approach is suggested.

The pilot plant which made possible the next step —taking the now proven process out of the experimental stage toward production—was this 100 KW. Lectromelt Furnace. Its larger size and higher power let their metallurgists approximate conditions expected under actual smelting conditions. Thus fewer faults remained to be corrected when operations moved from the Laboratories at Ottawa into the plant at Cobalt.





Lectromelt electrode holders and controls for the 600 KVA. smelting furnace at Cobalt Chemicals Limited. Concentrates are charged through the ducts seen at the right.

Left: Exacting control of the furnace produces a molten slag and matte at tapping time. At this stage, the matte contains cobalt, silver, nickel, copper and sulfur.

Whether your smelting process is still experimental or ready to put into production, there's Lectromelt equipment able to serve you. Our engineers have been conducting continuing research for many years on electrothermic reductions. This experience is available to you. For Catalog No. 105, write Pittsburgh Lectromelt Furnace Corporation, 322 32nd St., Pittsburgh 30, Pa.

*REG. T. M. U. S. PAT. OFF.

WHEN YOU MELT... MOORE RAPID *Lectromelt*

B.F.Goodrich

Universal tires roll 125,000 miles under 40 tons of coal

THE Colonial Coal Company of Madisonville, Kentucky, hauls coal from the stripping pit to the mine tipple. Forty tons is the weight of the average load carried by the company's 20 trucks over rugged gravel and cobblestone roads. The trucks roll as many as 60 hours a week—and every one is equipped with B. F. Goodrich Universal tires.

Some of the Universal tires now in use have seen 125,000 miles of this severe service. Colonial reports Universal tires can be recapped as many as three times. One reason for such outstanding performance records is the Universal tread. It is specially compounded to resist snags and cuts. The husky, non-directional cleats resist skidding and slippage, pull through the roughest going faster and easier.

Under the tread is the patented B. F. Goodrich nylon shock shield. Layers of strong nylon cords stretch together under impact to protect the tire body from smashing road shocks. You save 4 ways because of this protection: (1) more original hours of service (2) more recappable tires and more hours of service per recap (3) increased bruise resistance (4) less danger of tread separation.

Join the growing list of mine operators who report longer service at lower cost with Universal tires. See your B. F. Goodrich retailer today. The address is listed under Tires in the Yellow Pages of your phone book. Or write *The B. F. Goodrich Company, Tire and Equipment Division, Akron 18, Ohio.*

Specify B. F. Goodrich tires when ordering new equipment

"UNIVERSAL TIRES are better than any other make of tire I know," says Everett Offit (above), driver for Colonial Coal Co. This company averages over 5,400 hours of service from BFG tires.

SHASTA COAL CORP., Bicknell, Ind., is another user of B. F. Goodrich tires. "We like the Universal tread over other treads," the company reports. "It holds the road better." (Center Rib Universal is shown at right.)

Rubber-tired tractor speeds cleanup

Westmoreland Manganese Corporation, Batesville, Arkansas, speeds cleanup around both a 5-yd. dragline and a 2½-yd. shovel with their 19 mph rubber-tired Tournatractor. Material — clay containing 70% chert (flint rock) — is so abrasive that dragline teeth sometimes must be changed every 8 hours. Tournatractor tires, however, last well over 1000 hours. The set shown here, retreaded once, still has an estimated 45% of tread left after 983 operating hours.

Handles scattered assignments

Although Tournatractor spends most of its time cleaning around the 2 excavators, its 19 mph speed and mobility enable it to regularly maintain the 3-mile haul road. In spare time, Tournatractor also clears land, roots stumps, and levels dragline right-of-way.

"One crawler tractor," says Mine Foreman Hugh Insell, "couldn't begin to do what Tournatractor does for us."

Tournatractor's "go-anywhere" mobility and fast working speeds can pay off for you, too. Ask your LeTourneau-Westinghouse Distributor for a demonstration so you can judge its advantages for yourself. Tournatractor is now available with torque converter which improves performance, greatly reduces strain on engine, final drive, and tires.

Tournapull—Trademark Reg. U.S. Pat. Off. Tournatractor—Trademark T-404-M-b

"For rough pit work of this type, I'd rather have Tournatractor than any crawler. Its dozing speed enables us to keep hauling units moving with no delays due to spillage or uneven pit floors."

R. T. McDONALD
General Mine Supt.

How men on the job compare Tournatractor with crawlers

"One crawler tractor couldn't begin to do what Tournatractor does for us."

HUGH INSELL
Foreman

"I like the speed of Tournatractor, the easy way it maneuvers around, the easy operation of the blade."

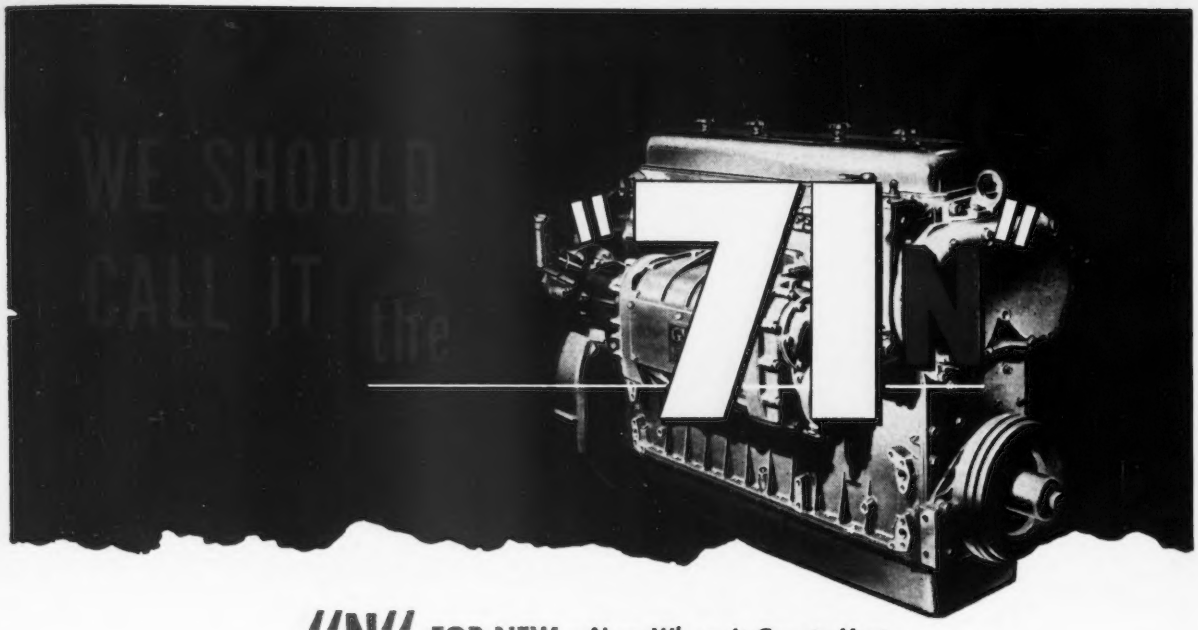
LEON McSPADDEN
Tournatractor Operator

LeTourneau-Westinghouse Company

PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

See the high-speed Tournatractor at the Mining Show at San Francisco September 20 to 24. Also see the C Tournapull Rear-Dump.



"N" FOR NEW—*New Where It Counts Most*

You don't have to be an old-timer to remember when the first General Motors Series 71 Diesel was introduced. We called it the "71" in 1938 and we call it the "71" today.

But in 17 years these design improvements from top to bottom have given operators higher horsepower, lower fuel consumption and longer engine life. And now, a whole series of new improvements has made this fast-stepping, compact, 2-cycle Diesel better than ever.

NEW **17 TO 1 COMPRESSION** gives better fuel economy, squeezing more power from every gallon of fuel.

NEW **"FIGURE 8" CYLINDER LINERS** give you a cleaner burning, more efficient engine. Air intake area is increased 32% for more complete fuel burning and better exhaust.

NEW **IMPROVEMENTS IN PISTON PIN, PIN RETAINER AND CAM FOLLOWER DESIGN** mean longer life, less maintenance cost. High-valve unit injectors last longer because the valve assembly is away from high cylinder temperature areas. Hard-chrome steel "Lite-Tite" piston rings resist wear; are tougher and more flexible and give many more hours of service.

And—best of all—in your next overhaul you can incorporate any or all of these new improvements in any GM Series 71 Diesel engine you're operating today. "The Inside Story" tells you how these new improvements can help cut your costs and speed your jobs. Mail the coupon today for your copy.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 30 to 300 H.P. • Multiple Units . . . Up to 893 H.P.

It Pays to STANDARDIZE on GM GENERAL MOTORS DIESEL POWER

Write For Booklet

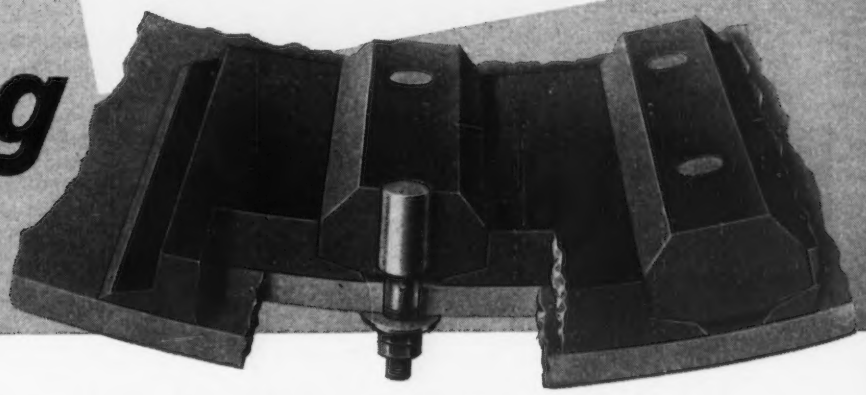
DETROIT DIESEL ENGINE DIVISION
General Motors Corporation
Detroit 28, Michigan

Please send me booklet "The Inside Story"

Name:_____
Position:_____
Company:_____
Address:_____
City & State:_____

Cut grinding costs

- U·S·S Lorain Rolled Plate Linings are in easy-to-handle sections, accurate sizes to permit quicker installation.
- Lift bars are designed for correct cascade action . . . height of lift varies according to conditions.
- Plates can be heat-treated to compensate for wear.
- Correct sizes make tighter joints—eliminate shell wash.
- Bolt supports located near the bottom of the bar . . . last for life of the lining.



with U·S·S Lorain Rolled Plate Linings

You can do more and better grinding, for less money, with U·S·S Lorain Rolled Plate Linings. The output of your mill increases when the usable diameter increases, and this is just what happens when rugged Lorain *rolled steel* plates are used instead of ordinary castings. Lorain Liners can be much thinner due to their superior strength. Their lighter weight simplifies handling.

You save money with U·S·S Lorain Rolled Plate Linings because they are readily installed and require less maintenance. The plates are accurately made and are in easy-to-handle sections for ready use. Severe localized wear at feed or discharge end of the mill can be balanced by heat-treating.

Lorain Liners are so durable that they remain serviceable until they're almost paper thin. You benefit from the use of the entire plate . . . there is less waste, longer wear. Mill downtime will be reduced and so will your upkeep costs.

The accurate size of U·S·S Lorain Rolled Plate Linings assures tight fit between the ends of the plates and between plates and lift bars, eliminating shell wash.

U·S·S Lorain Rolled Plate Linings are available—in the diameter, length and thickness best suited to your operating conditions—through leading mill manufacturers whose names will be furnished upon request.

U·S·S GRINDING BALLS are carefully made of special composition steel to take long, rough wear evenly. Samples from each production lot are thoroughly tested to make sure of surface hardness and maximum hardness penetration. They come in eleven sizes from ¾″ to 5″. For further information just return the coupon below.

United States Steel Corporation
Room 4436, 525 William Penn Place
Pittsburgh 30, Pa.

Without obligation on my part, please send me your FREE booklet on U·S·S Grinding Balls.

Name .....

Company .....

Address .....

City ..... State .....

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S LORAIN ROLLED PLATE LININGS AND U·S·S GRINDING BALLS

USS

4-283

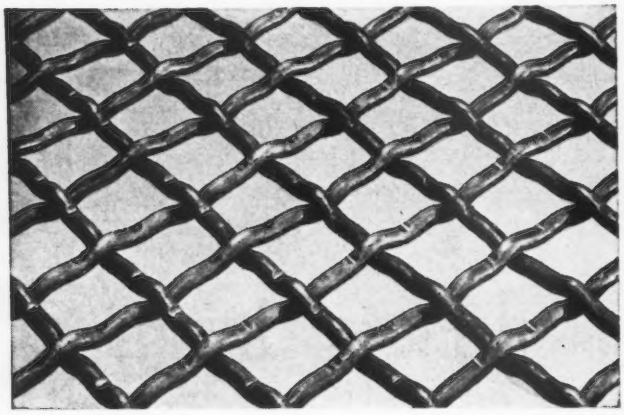
UNITED STATES STEEL

See Hewitt-Robins at San

Learn How Hewitt-Robins Can Help Solve Your Bulk Materials Handling Problems, Large or Small

Hewitt-Robins is the only company that designs and manufactures a complete line of equipment for handling and processing solids, liquids and gases in bulk. We specialize in vibrating equipment to screen, feed or shakeout material—belt conveyor systems (both belting *and* machinery) to convey solids in bulk—hose to handle liquids or gases.

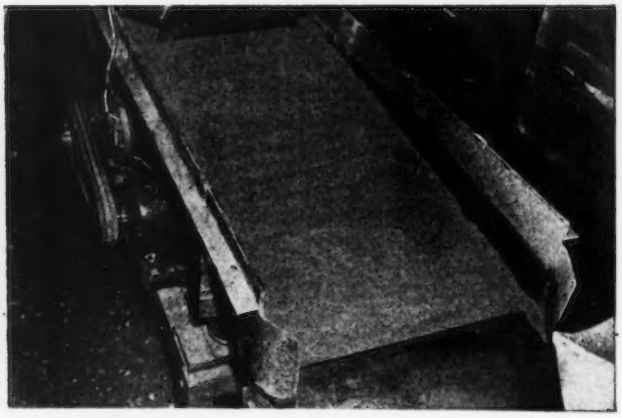
Throughout the world, Hewitt-Robins equipment and complete systems are setting new records for safe,



Screen Cloth. Hewitt-Robins screen cloth is specially engineered to accurately size large tonnages and cut screening costs . . . utilizing a full range of metallic wire to meet individual job requirements . . . available in standard production size openings from 3/16" and coarser; wire sizes from .105" up to and including 1" diameter.

Belt Conveyors. Hewitt-Robins designs and manufactures a complete line of belt conveyor systems engineered to meet the specific requirements of particular jobs . . . Belting, conveyor machinery and component parts are readily available from standard "on-the-shelf" stock, and are guaranteed to provide top conveyor performance.

Vibrating Screens. Hewitt-Robins manufactures four types of economical vibrating screens: . . . Gyrex® positive stroke 4-bearing screens; Eliptex® horizontal operating flat screens; Vibrex® full-floating, unbalanced pulley-type 2-bearing screens and the Eliptex Dewaterizer having specially designed Eliptex screen with micron-size opening stainless steel flat rod deck.



Vibrating Feeders and Conveyors. Fully mechanical, high capacity—low power consumption vibrating feeders easily maintained by your own personnel. Continuously balanced vibrating conveyors now available in longer units with higher capacities at lower horsepower. Handle a wide range of materials—wet or dry, lump or pulverized, packaged or loose, hot or cold, abrasive or corrosive.

HEWITT-ROBINS

EXECUTIVE OFFICES, STAMFORD, CONNECTICUT

Francisco Booths 307 & 321

dependable, economical operation . . . speeding up production and cutting costs-per-ton.

Remember when you visit the show this year in San Francisco, make it a point to see the big exhibit of Hewitt-Robins equipment . . . talk over your bulk materials handling and processing problems with our staff of experts.

Hose. Hewitt-Robins manufactures over 1,000 types of industrial hose . . . each designed to fill a specific hose application. Hewitt-Robins hose has proved its superiority on the job. In case after case, actual performance records prove that Hewitt-Robins hose is safer, performs longer, provides greater economy.

Shakeouts. Hewitt-Robins Car Shakeouts handle wet, compacted and even partially frozen loads. Capacities vary depending upon characteristics of material . . . average unloading time under 5 minutes per car. Two types: 5-ton HD (Heavy Duty) for handling up to 100 cars per day —3½-ton GS (General Service) recommended for up to 10 cars per day. Both models available with companion twin-hook Car Shakeout Hoist.

Here is a partial list of

HEWITT-ROBINS PRODUCTS

that will help you cut handling costs and increase operating efficiency.

MACHINERY

- Belt Conveyors
- Belt & Bucket Elevators
- Car Shakeouts
- Conveyor Idlers
- Dewaterizers
- Mechanical Feeders
- Foundry Shakeouts
- Mine Conveyors
- Reclaiming Systems
- Screen Cloth
- Stackers & Trippers
- Vibrating Conveyors & Screens

INDUSTRIAL RUBBER PRODUCTS

BELTING:

- Conveyor
- Elevator
- Transmission

HOSE:

- Acid
- Air & Air Drill
- Barge Loading
- Dust Suction
- Fire
- Fuel Oil & Gasoline
- Gasoline Pump
- Mud Pump Suction
- Oil Suction & Discharge
- Propane-Butane
- Road Builders'
- Rotary Drilling
- Sand Blast
- Sand Suction
- Sea Loading
- Servall®, All-Service
- Steam
- Tank Car & Tank Truck
- Vacuum & Air Brake
- Water & Water Suction
- Welding, Twin-Weld®

MOLDED RUBBER PRODUCTS

•

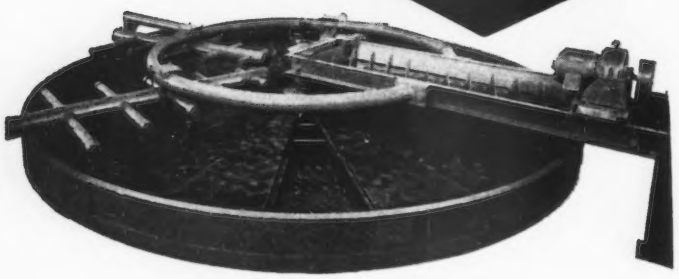
For information and service on industrial rubber products, contact your Hewitt-Robins Industrial Supply Distributor. Through his complete stock of Hewitt-Robins Rubber Products, and his familiarity with local field conditions, he can fill your supply needs promptly and correctly. See Classified Phone Book for the Hewitt-Robins Industrial Supply Distributor serving your area.

INCORPORATED

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City.

OLIVER UNITED FILTERS INC.

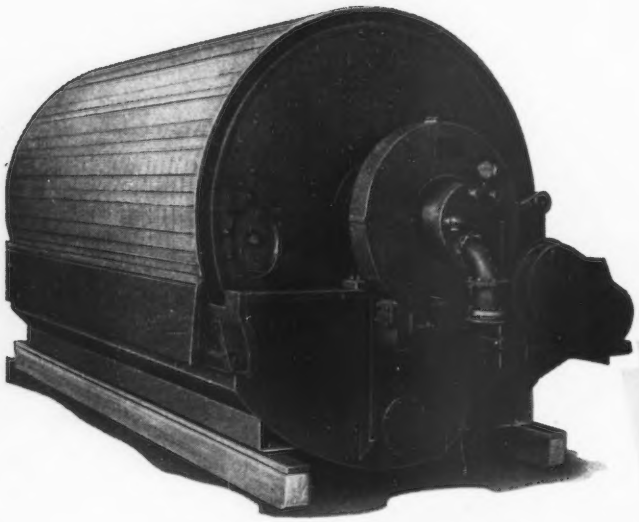
ORE



Note the Wide Filter Type Selectivity offered by Oliver United for the metallic and non-metallic mining industries:

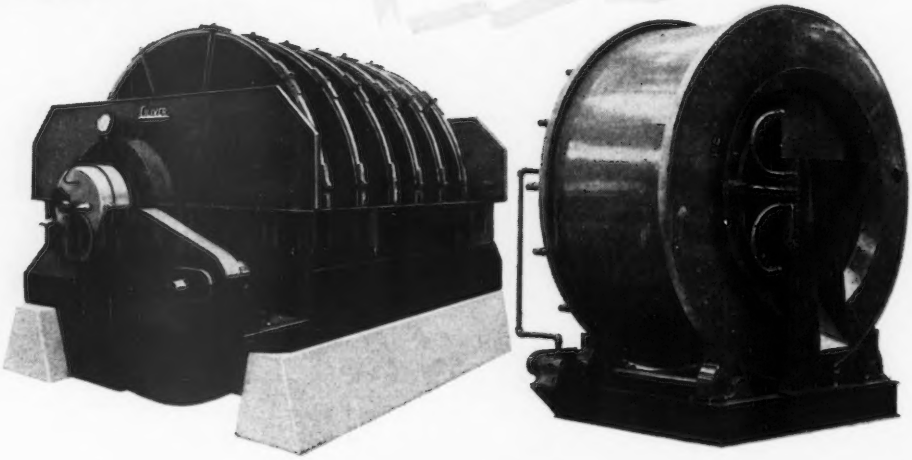
OLIVER DRUM FILTER
AMERICAN DISC FILTER
DORRCO INTERNAL DRUM FILTER
OLIVER HORIZONTAL FILTER

plus other types such as Sweetland and Kelly Pressure Filters, Oliver Panel and Precoat Filters, Oliver Pressure Filter.



Make a note when in our booth to ask about our Olivite Acid-Handling and Oliver Type L Chemical Pumps and our ODS Diaphragm Slurry Pump. They're doing some excellent work in industry.

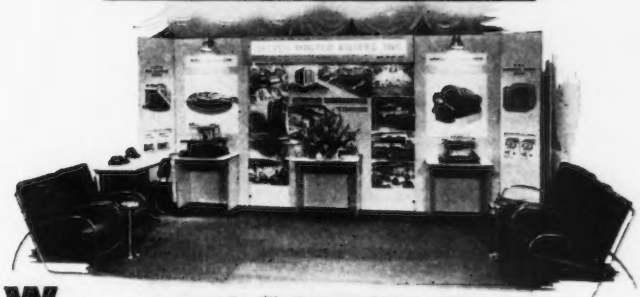
Our General Mining Catalog M-20 gives details of our ore filters. Send for your copy if you do not attend the convention.

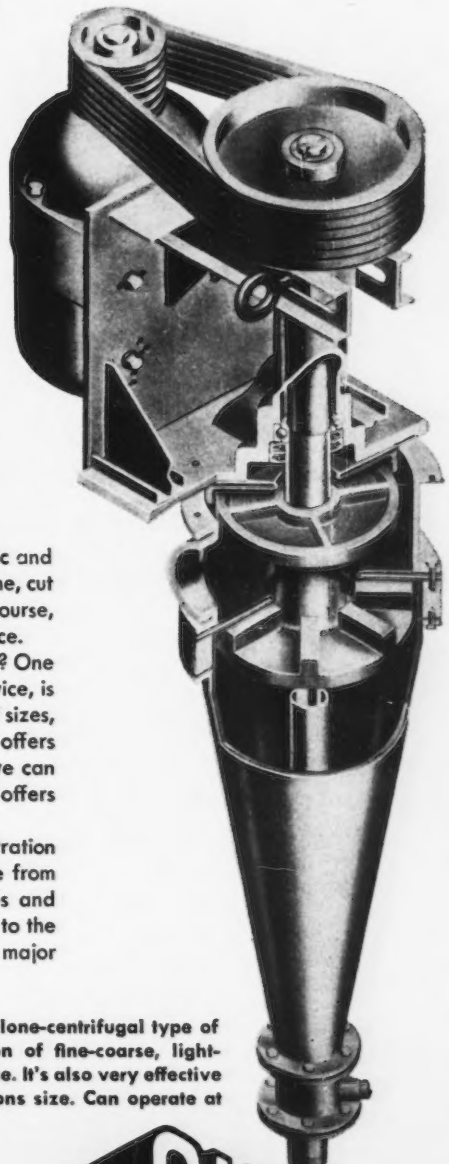


FILTERS

NOTE:
After this advertisement was prepared, our Booth Number was changed to
450

BOOTH 462
MINING SHOW
SAN FRANCISCO
September 20—23





We'll be at San Francisco with 'to scale' models of the American Disc and Oliver Horizontal Filters. We shall also exhibit a full size 10" Centriclone, cut away to disclose the internal design and mechanism. In attendance, of course, will be competent filtration specialists with lots of ore milling experience.

Why not drop in and discuss your filtration and separation problems? One important fact to keep in mind about Oliver United, its filters and service, is that it offers the widest variety of filter types, each in a wide range of sizes, from which to select. Take the four filters illustrated at the left. Each offers distinctly different filtering values. If none of these fits your picture, we can call on several other types, five of which are listed. Each of these, too, offers distinctly different filtering values.

As for experience, where would you most likely obtain the best filtration advice when selecting the most suitable type of filter? Wouldn't it be from Oliver United where you *know* there is a wide choice in filter types and where you *know* you can get filtration advice that is based on service to the mining industry going back nearly fifty years and covering every major mining district in the world?

The Oliver Centriclone is a combination liquid cyclone-centrifugal type of separator, capable of producing sharp separation of fine-coarse, light-heavy particles at any predetermined separation line. It's also very effective as a thickener. Size separations down to 10 microns size. Can operate at very high densities thus avoiding costly dilution.

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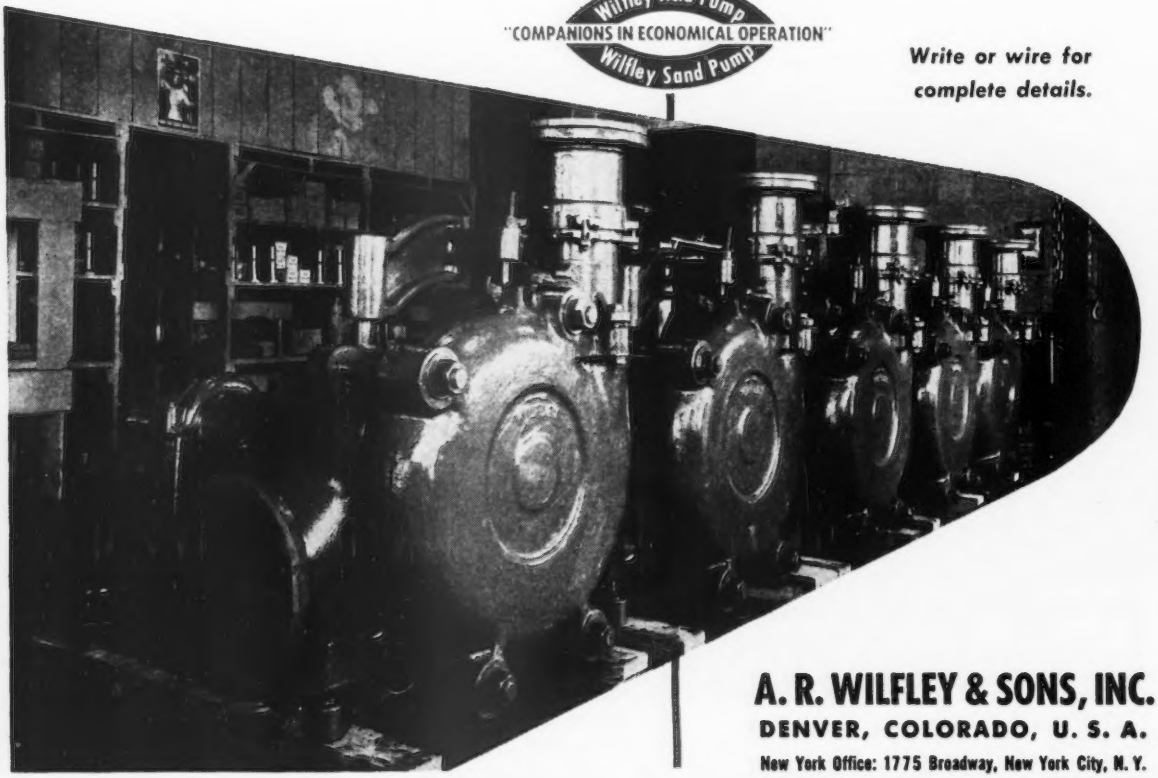

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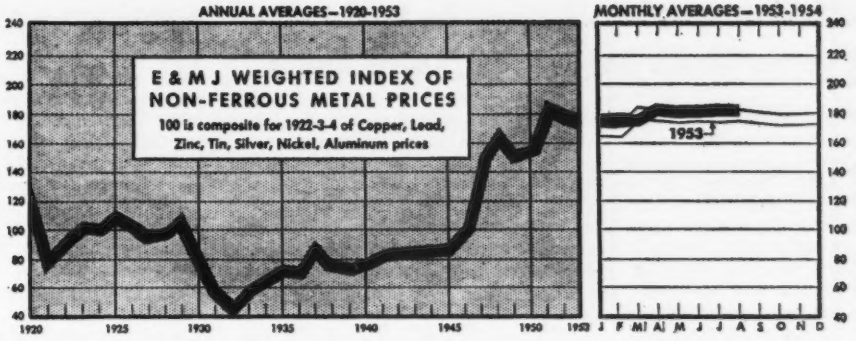
E&MJ OUTLOOK

PRICES



MARKETS

Sales volume was up in August, chiefly because of nervousness on the part of consumers that strikes may cut down the supply of copper, lead, and zinc.

Aluminum was raised in price, likewise lead, but tin declined and the *E&MJ* price index fell just a little from 184.68 in July to 184.65 in August.

Aluminum production is nearing capacity. Output in the U.S. during July was at the record high of 126,162 tons.

●

AT HOME

Industrial production is expected to push upwards moderately when auto makers, now shut down for retooling, start making new models in October and November. Autumn outlook for retail trade is excellent.

One positive way to boost uranium production in the U. S. is to increase the depletion allowance still more. The question is not: Should we allow a few lucky uranium hunters to make a fortune?, but: How badly do we really need the uranium? Only the Government knows.

Some uranium producers may soon test legal means of using the U_3O_8 concentrate price per lb recovered instead of the ore price per lb of contained U_3O_8 to obtain more favorable depletion allowances.

Germanium prices are being shaved because of increased production domestically and abroad. Competition is stiffening.

Despite low prices for lead and zinc, some mining companies making money in other fields are looking for lead and zinc properties. The time to buy is when metal prices are low.

●

LABOR

The mining industry was taken by suprise early in August when the steel and aluminum wage patterns failed to spread over into the nonferrous field without work stoppages. Mine-Mill's unexpected walkouts based on higher wage and benefit demands reflects the bitter battle which Mine-Mill is fighting against raids over the Communist issue. Mine-Mill has to get more for its members.

●

ABROAD

India whacked off the 15% export tax on manganese ores in response to slumping world demand. U.S. manganese imports in May totaled 218,726 short tons. Estimated consumption was only 139,000 short tons.

In August, Canada witnessed three events that will prove benchmarks in mining history: (1) Kitimat poured the first aluminum ingot, derived from Jamaican bauxite. (2) Iron Ore Company of Canada shipped the first shipload of Labrador ore to U.S. ports, and (3) Sherritt-Gordon produced its first commercial batch of powdered nickel and ammonium sulphate.

West German companies are offering to finance equipment for refineries and metallurgical plants in Chile and Argentina. One deal would finance an Argentina iron and steel project to be fed with Peruvian coal and iron ore shipped to Argentina in exchange for wheat and beef.

MARKETS—Trends and Prices

Strikes Stimulate Buying Interest in Metals—President Turns Down Request for Tariff Relief

THE VOLUME OF BUSINESS booked during August in nonferrous metals improved for reasons that were not exactly encouraging to either the producer or the consumer. Unexpected work stoppages at mines and fabricating plants upset the market and caused buyers to place orders against their estimated forward needs out of fear that strikes may result in higher prices. The decision of the Government to step up stockpiling of lead and zinc in lieu of altering its stand on the import tariff also inspired new buying. Actual consumption of metals continued at about the same rate as in recent months. The operating rate of the steel industry, if anything, dropped slightly during August.

Wage contracts renewed during the month followed the general pattern set by the steel industry. In several instances workers got a little more than under the agreement announced previously by steel producers. This means higher costs, and where producers have been operating under adverse price-cost conditions price adjustments were noted. The most important change announced during the last month was in aluminum. Alcoa advanced its quotation on primary 99% pig aluminum one-half cent to 20½c, and on ingot 0.7c to 22.2c, effective Aug. 5. Both Reynolds and Kaiser moved up their selling basis to this level on the following day. The increase in the price was not sufficient to threaten the favorable competitive position that aluminum enjoys over most other nonferrous metals. Lead advanced late in the month on the rise in London, along with stockpiling developments. Tin sold down as buying interest moderated. The net result of the price changes as reflected in the *E&MJ* index was a fractional dip—from 184.68 in July to 184.65 in August. In the same month last year the index stood at 182.70.

President Eisenhower's decision to do nothing about the lead-zinc import tariff at this time naturally disappointed domestic producers who felt all along that some relief was necessary to offset higher costs at mines and smelters operating in the U. S. In turning down the Tariff Commission's recommendation for tariff relief, the President said "the outlook for lead and zinc is improved." (See p 132.) He noted that there were some excess stocks at present but "it appears that these inventories can be reduced by stockpiling purchases together with a high rate of consumption which is indicated by the general economic outlook."

Affirmative steps announced by the President include stockpiling, under which the Government "could" purchase up to 200,000 tons of lead and 300,000 tons of zinc in the current fiscal year, which ends June 30, 1955; acquisition of metals of foreign origin for a supplemental stockpile authorized under the Agricultural Trade Development and Assistance Act. However, he warned foreign producers that increased stockpiling has been designed to help domestic production.

General Services Administration asked for offers of lead and zinc for the stockpile to be executed in September. This marks the fourth consecutive month of such purchases and the results are becoming apparent in falling surplus stocks now in the hands of producers. As on previous occasions, the metal to be purchased must be of domestic origin mined subsequent to April 1. The latest request calls for delivery by Nov. 15.

Kennecott's copper operations in Utah, New Mexico, Nevada, and Arizona closed down on Aug. 16 when union officials presented the company with what amounted to an "ultimatum" that temporarily ended all contract negotiations. Union officials demanded a general wage increase of 8c an hour and other benefits. The strike was unexpected and disrupted business in copper. General price uncertainty followed. A strike at Kennecott's El Teniente mine in Chile added to the confusion. A week later negotiations at Anaconda's operations in the U. S. broke down and the strike movement spread. Demand for copper improved and supplies soon dried up. There was no move to raise the price above the 30c basis in the domestic market. Most operators took the position that the strikes would end soon. On Aug. 28 it was announced in Salt Lake City that the dispute at Kennecott's mines had been settled and local unions had five days to ratify the agreement. Losses in output will be felt in the fourth quarter.

During the seven months of 1954 that ended with July 31, producers shipped 681,175 tons of refined copper to domestic fabricators. In the Jan.-July period of 1953 the deliveries totaled 908,409 tons. Between stockpiling and a reduced supply, stocks of refined copper in the hands of domestic producers declined from 125,759 tons at the end of March to 68,921 tons at the end of July.

Lead advanced to 14¼c, N. Y. on Aug. 25. The price rose largely on the strength of the metal on the London Metal Exchange where a squeeze in the cash position caused the market to move up to £100 per long ton asked. The improved demand for lead outside of the U. S. has been pronounced so far this year. There are strong indications that countries behind the Iron Curtain have been getting more lead, along with copper and other items.

Smelters' stocks of slab zinc at the end of July totaled 197,885 tons, which compares with 201,124 tons a month previous and 209,828 tons two months previous. With deliveries to the Government increasing, the surplus is expected to fall steadily from now on. Out of total deliveries of 73,886 tons in July, shipments on Government account came to 13,214 tons. Though the domestic market was more active and strong, the quotation continued on the basis of 11c for Prime Western, East St. Louis, throughout the month.

Reduced tension in the Far East was the direct cause of price unsettlement in tin. Optimism among producers over the international agreement continues, though the chances are good that the ceiling price proposed under the plan may be lowered somewhat to satisfy France and other consuming countries.

Though the U. S. authorities have announced that they will not purchase additional supplies of quicksilver at higher than $225 per flask, the supply situation remained tight and spot quotations were

Average Prices for August (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	29.700
Electrolytic, export, refinery	29.492
Lead:	
Common, New York	14.058
Common, St. Louis	13.858
Silver and sterling exchange:	
Silver, New York, per oz.	85.250
Silver, London, pence per oz.	72.940
Sterling Exchange, "Checks"	281.324
Zinc:	
Prime Western, East St. Louis	11.000
Prime Western, delivered (g)	11.500
Tin:	
New York Straits	93.356
New York, 99% min. (e)	92.356
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$290.000
Antimony (E&MJ) (d)	31.970
Antimony, bulk, Laredo	28.500
Antimony, in cases, Laredo	29.000
Platinum, refined, per oz.	$84.000
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus, ingot	22.106
Magnesium, ingot	27.000
Nickel (f)	60.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lots, packed in cases f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.
(g) Delivered where freight exceeds 0.5c.

Markets Continued on Page 140

largely nominal at $290 a flask and upward.

Manganese ore prices weakened as steel and alloy makers bought sparingly. The Indian Government has abolished its 15% export tax on manganese ore to stimulate trade.

Chrome ore imports in the first half of 1954 totaled 926,324 short tons, which was more than double U.S. consumption estimated at 423,582 tons. Domestic production in the Jan.-June period amounted to only 76,913 tons.

Tungsten ore quotations showed little variation throughout the month.

"Free" Gold Market

Gold transactions declined about 20% in August. Russia ceased selling gold in the European market early in the month. Prices advanced in London and Paris largely because of weakness in currencies. The Indian market was active and prices realized were 5% higher. Pick's Currency Report quotes, per fine oz:

	COINS		BARS (12.5 kg.)	
	July 30	Aug. 31	July 30	Aug. 31
NEW YORK, transit	.....	.....	$35.10	$35.10
MANILA	$41.75	$41.50	38.00	38.00
HONG KONG	41.50	41.50	38.00	37.95
BOMBAY	49.50	50.50	47.00	49.50
TANGIER	41.50	40.85	35.08	35.10
BEYROUTH	41.75	41.95	35.25	35.25
PARIS	41.75	42.15	35.75	35.65
BUENOS AIRES	41.25	41.00	38.50	38.40

Note. All prices are computed at the free or black market value of the U. S. dollar in the local markets

Major Metals

U. S. DAILY AND AVERAGE PRICES

Aug. 1954	Elertrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc Delivered (f)	Zinc East St. Louis
2	29.700	29.675	95.500	14.000	13.800	11.500	11.000
3	29.700	29.500	95.000	14.000	13.800	11.500	11.000
4	29.700	29.675	95.625	14.000	13.800	11.500	11.000
5	29.700	29.300	94.750	14.000	13.800	11.500	11.000
6	29.700	29.300	94.250	14.000	13.800	11.500	11.000
7	No Market	29.575	94.250	14.000	13.800	11.500	11.000
9	29.700	29.350	93.000	14.000	13 800	11.500	11.000
10	29.700	29.550	93.375	14.000	13.800	11.500	11.000
11	29.700	29.400	93.250	14.000	13.800	11.500	11.000
12	29.700	29.550	92.625	14.000	13.800	11.500	11.000
13	29.700	29.525	92.625	14.000	13.800	11.500	11.000
14	No Market	29.450	92.625	14.000	13.800	11.500	11.000
16	29.700	29.575	93.000	14.000	13.800	11.500	11.000
17	29.700	29.475	92.625	14.000	13.800	11.500	11.000
18	29.700	29.375	92.500	14.000	13.800	11.500	11.000
19	29.700	29.250	92.625	14.000	13.800	11.500	11.000
20	29.700	29.450	92.625	14.000	13.800	11.500	11.000
21	No Market	29.475	92.625	14.000	13.800	11.500	11.000
23	29.700	29.475	93.250	14.000	13.800	11.500	11.000
24	29.700	29.475	93.250	14.000	13.800	11.500	11.000
25	29.700	29.675	93.250	14.250	14.050	11.500	11.000
26	29.700	29.450	93.125	14.250	14.050	11.500	11.000
27	29.700	29.625	93.125	14.250	14.050	11.500	11.000
28	No Market	29.575	93.125	14.250	14.050	11.500	11.000
30	29.700	29.625	92.750	14.250	14.050	11.500	11.000
31	29.700	29.450	92.500	14.250	14.050	11.500	11.000
AVERAGES FOR MONTH							
Aug.	29.700	29.492	93.356	14.058	13.858	11.500	11.000
AVERAGES FOR WEEK							
Aug.							
4	29.700	29.550	95.646	14.000	13.800	11.500	11.000
11	29.700	29.413	93.813	14.000	13.800	11.500	11.000
18	29.700	29.492	92.667	14.000	13.800	11.500	11.000
25	29.700	29.467	92.938	14.042	13.842	11.500	11.000
CALENDAR WEEK AVERAGES							
Aug.							
7	29.700	29.504	94.896	14.000	13.800	11.500	11.000
14	29.700	29.471	92.917	14.000	13.800	11.500	11.000
21	29.700	29.433	92.667	14.000	13.800	11.500	11.000
28	29.700	29.546	93.188	14.167	13.967	11.500	11.000

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Aug. 1954	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold (d) London	Gold (d) United States
2	281.8125	85.250	Holiday	Holiday	$35.00
3	281.8125	85.250	72.250d.	249s. ½d.	35.00
4	281.8125	85.250	72.250d.	249s. 0d.	35.00
5	281.7500	85.250	72.250d.	248s. 11½d.	35.00
6	281.6875	85.250	72.250d.	248s. 11½d.	35.00
7	(e)	(e)	(e)	(e)	35.00
9	281.6875	85.250	72.250d.	248s. 11½d.	35.00
10	281.6250	85.250	72.250d.	248s. 10½d.	35.00
11	281.5625	85.250	72.250d.	248s. 10d.	35.00
12	281.5625	85.250	72.250d.	248s. 10d.	35.00
13	281.5625	85.250	72.250d.	248s. 11½d.	35.00
14	(e)	(e)	(e)	(e)	35.00
16	281.5000	85.250	72.500d.	248s. 11½d.	35.00
17	281.5000	85.250	72.750d.	248s. 11½d.	35.00
18	281.2500	85.250	72.750d.	249s. ½d.	35.00
19	281.2500	85.250	73.500d.	249s. 3d.	35.00
20	281.3125	85.250	73.750d.	249s. 1d.	35.00
21	(e)	(e)	(e)	(e)	35.00
23	281.2500	85.250	73.750d.	249s. 3d.	35.00
24	281.1250	85.250	73.750d.	249s. 3½d.	35.00
25	280.7500	85.250	73.750d.	249s. 5d.	35.00
26	280.8125	85.250	73.750d.	249s. 8d.	35.00
27	280.5625	85.250	73.750d.	249s. 8d.	35.00
28	(e)	(e)	(e)	(e)	35.00
30	280.4375	85.250	73.750d.	249s. 9½d.	35.00
31	280.5000	85.250	73.750d.	250s. 0d.	35.00
AVERAGES FOR MONTH					
Aug.	281.324	85.250	72.940d.	—	35.00
AVERAGES FOR WEEK					
Aug.					
4	281.775	85.250	—	—	—
11	281.663	85.250	—	—	—
18	281.475	85.250	—	—	—
25	281.138	85.250	—	—	—

Calendar Week Averages, New York Silver: Aug. 7th, 85.250; 14th, 85.250; 21st, 85.250; 28th, 85.250.
(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c per pound, the average differential for delivery charges.

(b) Our "export" quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.50c.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one quarter-cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines...

G. P. Lutjen

Putting together this month's issue was quite trying—that is, the editors were trying to look like they deserved being paid for their contributions. Not that the material isn't high caliber; in all modesty, we can only refer to it as "tremendous". But take that gay deal starting on p 119, "Food and Fun in San Francisco" (which incidentally bears no relationship whatsoever to the sketch on the left; we'll get to that later). What grim determination, what devotion to duty, what sacrifice it must have required of Anne Simpson and George Tenney to get that story into the book! As we said, we have no criticism of the results: it's an excellent job that should help make anyone's visit to the mining show more pleasant, but is it work?

Then there was a 2,000-mi tour of the Colorado Plateau undertaken by members of the staff. The trip had it's darker (and dryer) moments, but on the whole it was what most Americans might save money all year for and call a vacation. The journey did make it possible to round up a large volume of information for the uranium minded, and isn't everybody? How and why the whole project was undertaken is described on p 89. You are the only judge of how well the whole thing turned out on the ensuing 30 pages.

One of real bonuses of the trip was having Phil Simmons, mining engineer with the AEC, as a traveling companion for part of the time. Seldom have we so enjoyed swapping ideas, stories and innuendo.

It seems only fitting, and it is a pleasure to extend to Brother Simmons, the dubious distinction of honorary membership in the E&MJ Chowder, Marching and Margaret Sullavan Society. Although the Society's by-laws specifically prohibit constructive contributions in any manner, shape or form—and Mr. Simmons violated this rule continuously—the superb quality and startling variety of his unconstructive contributions more than overbalance any longcomings on the positive side of the ledger.

Take for instance, the night he set fire to our digestive systems. It was in Gallup, N. M. Sr. Simmons, turned vaquero for the evening, strongly advocated dining at a small but highly authentic Mexican restaurant. Inadequately warned about the incendiary nature of the fare, we nonchalantly ordered the plato azul especial. It was delicious, we're sure, but for several days thereafter, we considered suing the restaurant and Simmons too, for arson.

Then there was that campsite at Temple Mt. Out of 107,000 sq mi of Plateau country, we had to select 100 sq ft which housed an entire village of savage ants on which to park our sleeping bags. We learned to tolerate ants at picnics, but this was the first time we've *been* the picnic. By jiminy, there are a few things we could tell Disney about "The Living Desert".

It has been argued, successfully, that these minor catastrophes were our own damn fault. What wasn't our fault, was one of the most pleasant events of the entire safari. One cool evening in the Lukachukais, Phil Simmons cooked a steak for dinner. In a long career of steak eating we have never tasted its equal. The best thing we can do for loyal readers is pass along the recipe as we observed it.

Take an empty Seven-Up bottle and wash it out with tepid water, preferably from a water bag that has been hanging on the front of a jeep for 300 mi of desert travel. Drop in a few pieces of garlic and mull for 10 minutes with a twig cut from a juniper bush. Add one inch of olive oil and one inch of red wine. (Note: A pinch of Moenkope dust should be added for authentic flavor. If this recipe catches on we plan to market the stuff in 2-oz cans.) Don't stir; just put the bottle, safely wrapped, in the back of a jeep and travel 156 mi on what passes for roads on the Colorado Plateau. (Note: If these facilities are unavailable, ladies, have your husband take the bottle down to the mill and tie it on a vibrating screen.)

Next, take the steak which has been carefully wrapped all day in a sleeping bag, and with a sharp knife make a series of longitudinal cuts on both sides of the steak, not deeper than ½ in. (Note: If your butcher permits installment buying, steak should be at least one inch thick.)

Build a fire out of oak logs and allow to burn down to red hot coals. While this is taking place, see to it that 8 wasps (no flies) have ample time to buzz back and forth over the steak. Cook slowly over burning coals, turning frequently and basting with mixture from Seven-Up bottle.

Ladies, if your husband says it's the most delicious steak he ever ate, thank Phil Simmons. If he doesn't, get a new husband; the present one is in bad shape.

Ever wonder what became of old Kotelnikov? We never did either, but we found out anyhow. It's all on page 228 along with a lot of other goings on in the Russian uranium industry.

Few things could be more delightful than a visit to San Francisco in September, or any other month. We hope that you plan on being at the Mining Show. Be sure to stop in at Booth 500 to pick up a copy of "Food and Fun in San Francisco". It's bound to give you some ideas for wiling away those long inviting, fog-bound California evenings.

If you can't make the show, look for a report on the technical sessions in the October issue of E&MJ. And in November, we'll devote part of the issue to taking you on a tour of the exhibit as we see it. Alright, you on the right! Move over and give us a whack at that theodolite.

ENGINEERING AND MINING JOURNAL

SEPTEMBER 1954

U_3O_8—Formula for Profits

SOUND VENTURE MONEY is asking this question—"What will happen to the price of uranium after the present AEC buying schedules expire in 1962?" Top-secret military requirements rule out any appraisal of demand for uranium, but an analysis of current AEC activities provides some significant clues to the future of uranium.

First, the AEC domestic buying schedules have been expanded and/or extended four times in the past six years. This justifies an assumption that the buying program could be extended again. The 1962 date was simply chosen as marking a convenient contractual period. It does not necessarily indicate an end to any AEC program.

Second, if any cut-backs in uranium requirements were in sight, it would be hard to justify the expanding exploration and milling programs now under way on the Colorado Plateau. AEC's latest Semi-Annual Report also mentions that the Commission is negotiating with several phosphate chemical firms for the construction of additional by-product uranium facilities.

"Foreign sources continued to increase during early 1954 with newer suppliers becoming more important" according to the same report.

AEC's $9-billion worth of plant facilities for production of fissionable materials will not be in full operation until 1958 or 1959. This would not suggest any cut-back in raw materials in 1962.

The accelerating Government buying program indicates that uranium is the best available fissionable source material. A good substitute for uranium is not apparent.

AEC representatives testified at a Congressional hearing in June that "a small number of full-scale privately owned and operated power reactors are likely to be on the line before 1965." Some of the nation's largest and most progressive utility and manufacturing firms are pushing into the nuclear power picture enthusiastically, and their programs are matched by large blocks of venture capital foreseeing attractive opportunities.

Virtually every major mining company is getting into the uranium business in one way or another, and it's our guess that these companies have investigated uranium's future thoroughly.

Is U_3O_8 therefore really a formula for profits? We believe that it is, and that much of the answer lies in the following report on the current boom on the Colorado Plateau.

Questions Answered in This Report

What are the highlights of Plateau activity?

What axioms should guide potential uranium producers?

Which geologic horizons are most productive?

What are the guides to ore targets?

Does airborne reconnaissance pay off?

What do you buy when you buy an exploration drill hole?

In mining, which is more important, tonnage or grade?

Is there money in milling?

What are the key points in uranium extraction?

How is uranium leached?

Can you get more for your ore?

How do you perfect claim ownership?

How does the Government help producers?

What does it cost to operate?

Who's who on the Plateau?

U_3O_8 - Formula for Profits

THE BIGGEST BOOM in the history of American mining is taking place in the uranium industry today—now. And it's only the beginning!

With the soaring interest on the part of serious investors in exploring for and producing uranium, *Engineering and Mining Journal* decided that the most helpful contribution it could make to its industry was to furnish a clear picture of the uranium situation as it stands today.

The best place to start out in getting the facts about uranium is the Grand Junction Operations Office of the U. S. Atomic Energy Commission. Sheldon Wimpfen, manager, and his capable staff not only answered a lot of our questions, but gave us much invaluable advice and assistance in planning a 2000-mile jeep trip that would take us to important mining and exploration operations and permit us to interview people in all phases of the uranium business; to find the answers to questions, like those on the preceding page, which are being asked on all sides.

Our talk with Sheldon Wimpfen also produced an accurate picture of the phenomenal growth and present scope of the uranium industry. Here are some of the facts:

Ore production has doubled every 18 months.

Producers shipping ore on the Colorado Plateau number more than 550.

Employment in the uranium industry tops 8,000 with some 1600 persons employed in the processing plants.

Exploration drilling by the Commission is being conducted at the rate of 1-million feet per year; private enterprise is drilling in excess of 2-million feet per year.

Bonuses for initial and other production total more than $3,725,000 under the program to encourage and assist the development of new sources of domestic ore. A total of 461 properties has been certified as eligible for bonus payments.

Access roads built by the Government through June 1954 reach 993 mi and cost $6-million (about $500,000 was contributed by the states involved). In fiscal 1955 it is estimated that 173 more miles of road will be built, costing $2,500,000.

As a measure of interest in the uranium industry, visitors to the Grand Junction office of the AEC have exceeded 3,000 per month with as many as 205 in one day. Mail receipts exceed 6,000 pieces per month.

Mining companies, large and small, investment houses, engineers, prospectors, geologists and hordes of non-professionals have entered, are about to enter, or are thinking of entering the uranium business. The lures are the healthy profit to be made from a mineral with a guaranteed price and the simultaneous rendering of a service to the nation.

There is a place for all. Some types of deposits, small and isolated, can best be mined with low cost methods and provide a handsome profit for a couple of industrious miners. Other deposits lend themselves to large scale production and high degrees of mechanization.

Many deposits, of both types and of ranges in between, have been found, but most experienced uranium men on the Plateau confidently expect that deposits comparable in size and grade will continue to be discovered at the present fantastic rate for a number of years. Thousands of square miles remain to be explored. In the past few years the province of the Plateau, which is a loosely defined area at best, has been extended from South Dakota to southern Arizona, and other entirely separate areas have brought forth producers. Geologically, favorable ground for discovery has expanded from the Salt Wash formation to encompass 30 distinct formations that show uranium mineralization.

Our jeep expedition took us to dozens of exploration and mining operations and enabled us to interview scores of mine operators at large mines and small, geologists, prospectors, engineers, and even lawyers and financial men. We are grateful for their generous contributions of time and information which we feel will provide *E&MJ* readers, already in the uranium business or about to be in it, with guideposts to more efficient, more profitable enterprises. What you read on the following pages is based solely on the experience of uranium veterans; we have studied their practice to point out the shortcuts as well as the pitfalls. Most important, we pass along the sum of their thinking for your guidance. In some cases we have called upon experts to summarize the thinking in their fields and come up with a weighted average.

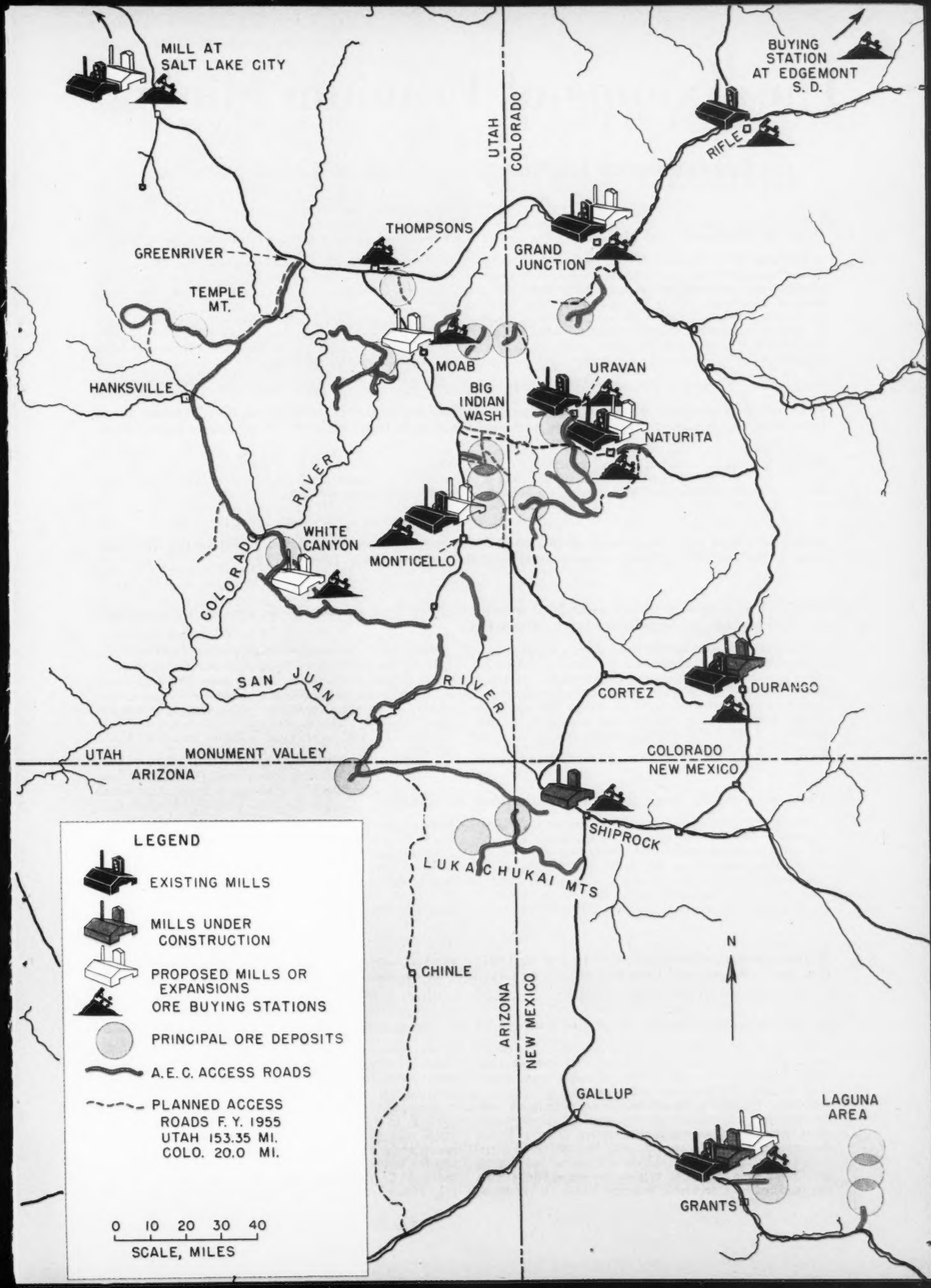
All the facts you find on the next 30 pages are within the bounds of security regulations as set forth in the Atomic Energy Act. In a few cases we have made some guesses based on observation that in no way reflect any "inside" information. They are just guesses.

On a company basis, or on a personal basis, we hope you'll find this issue of *E&MJ* helpful in assessing your own future in the uranium industry.

Al Knoerr
George Lutjen

SHELDON WIMPFEN, manager of the Grand Junction Operations Office of the Atomic Energy Commission, must keep the Government's program in high gear.

THE COLORADO PLATEAU, over 107,000 sq mi in area, supports 550 uranium ore producers with room for more.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The Axioms of Uranium Mining

Uranium men learned these things the hard way

1. Over the long pull, the biggest profits lie in a well planned, long-term exploration program.

Discovery of rich orebodies which have paid off so spectacularly, requires luck. A well-planned, long-term exploration program puts you in a position to be lucky. On the basis of experience, and in the opinion of most uranium men, such a program should, at least, uncover a number of modest commercial deposits. For the large company, opinion is that these should be mined by the company with proceeds supporting continued exploration. In fact, a good many veterans in the uranium business feel that a large investor would do well to buy an operating property, swap dollars for ore plus experience as it were, and start from there.

For the individual, a good return can be made mining a small orebody if capital outlay is not prohibitive. Alternatively the orebody can be sold for funds with which to continue prospecting for a bonanza.

2. Regardless of quantity or quality of experience elsewhere, the record shows that it takes about two years for engineers, prospectors and geologists to become effective in uranium exploration.

With this in mind, the individual prospector should see that his grubstake is adequate for an extended stay. The large investor should not expect immediate results from personnel transferred from other fields, or should obtain the services of a man who has had two years or more Plateau experience under his belt. A suggestion for newcomers: a textbook on sedimentology and a nodding acquaintance with uranium chemistry will help.

3. Make sure that you learn both state and federal mining laws, and equally important, find out what is the prevailing local custom regarding the mining laws. **(See p 112)**

4. Think of mining in terms of pounds of uranium rather than necessarily in tons of ore but don't get the idea that this eliminates large enterprises.

Uranium mines can be over-mechanized. Although large tonnages of rock are handled cheaply, resulting dilution has taken the profit. (See "Marketing Uranium Ore", p 110). A number of small operations tied together by lease or buying agreement can be very successful, as witness USV and VCA. Several companies have also operated successfully by considering a number of scattered orebodies as different stopes in one mine.

Then there's the bonus to consider. If five small orebodies each contain 10,000 lb of U_3O_8 and otherwise fill the definition of new properties as contained in Circular 6, they each qualify for a $35,000 new production bonus; a total of $175,000. If one property was large enough to contain the total 50,000 lb. of U_3O_8, total production bonus would be $35,000. The AEC is interested in buying pounds of U_3O_8, not tons of rock.

5. There is generally more profit in mining than in milling.

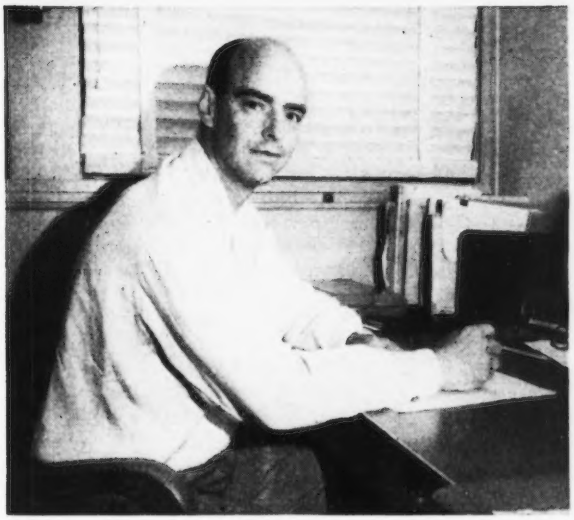
This is the consensus of opinion of men on the Plateau who are in a position to know. (One condition: a reasonable price for the orebody.) The best situation profitwise, is to both mine and mill the ore. In this way the 23% depletion allowance can be computed on the price per pound of uranium in the concentrate, rather than on the pound of uranium in the ore, which means more dollars for the miner. Not everyone can build a mill however, (see "Who Builds the Mill", p 103), and the AEC, who has the say, feels that a 200-ton per day unit is the practical minimum. It could be worth computing the slightly higher milling cost per unit in a smaller mill and comparing it with savings to be made through the depletion allowance if you undertake milling your own ore.

6. If you seriously intend to explore for and mine uranium, you can get a lot of helpful information and save yourself time and money by talking with on-the-spot AEC officials first.

7. If you are going into the uranium business by buying uranium stocks, be careful.

Among many attempts to legitimately raise money for producing uranium, there are a number of somewhat unsound promotion schemes, so that all stock issues require close scrutiny; the good ones will stand up.

Munroe Pofcher, a New York attorney, formerly with the AEC and actively interested in uranium developments, offers sound advice to would-be investors. Make sure that the company's officials are not only responsible businessmen, but that at least some of them are experienced in uranium. Make sure that legal opinion on the property titles was rendered by a reputable attorney. Check all valuations of properties or orebodies; does reported value mean gross value in the mine or net value at the mill? Check the capitalization of the company and determine the size of the orebody that must be discovered before you can recover your investment and make a profit. If royalties are in line (10% to 15%) and the mine is not too inaccessible, the investor may generally figure that each ton of $30 ore will return about $10 in profit before taxes. For a million dollars net before taxes, an orebody of about 100,000 tons is required. Of the 550 uranium producers on the Plateau, only 15 have ore reserves of over 100,000 tons.



Where to Look For Uranium

Improved geologic techniques show:

Where to find ore in new areas.

How to find new ore in old areas.

Dr. Robert J. Wright, Chief Geologic Branch, Exploration Division, AEC, Grand Junction, Colo.

IMPORTANT DEVELOPMENTS in uranium exploration have taken place within the past few years. At the time of the first atomic explosion, in 1945, the main source of domestic uranium was the Salt Wash member of the Morrison formation. The mines were mostly in the Gateway-Uravan-Slick Rock area of western Colorado, where uranium had been mined since 1899. As of 1945, our known reserves were limited largely to this part of western Colorado and a few other localities such as Temple Mountain, Utah.

During the past nine years ore has been found in many new areas. The Grants district of northern New Mexico, Lukachukai area of northeast Arizona, Monument Valley area of northern Arizona, White Canyon district of Utah, Big Indian Wash district of Utah. Many other areas of lesser importance have come into production. Some of the new orebodies were found in formations which had previously yielded little or no production —for example, the Chinle formation and the Todilto limestone. But now, ore has been mined from more than a dozen formations ranging in geologic age from Permian to Eocene. Mining localities are scattered over large portions of Colorado, Utah, Arizona, and New Mexico.

While ore was being discovered in new localities and in formations that had previously received little attention, new orebodies continued to be found in the old uranium producing belt of western Colorado. Today this area is being worked and explored as never before.

Thus, two trends in the last few years of uranium exploration can be noted—one, discovery of orebodies in new localities and, commonly, in little explored formations and, two, discovery of new orebodies in old producing areas. These twin phases of ore findings are considered in turn below. The techniques to be described are not original with any one person or group but represent combined experience of company geologists and geologists of the U. S. Geological Survey and U. S. Atomic Energy Commission.

Space does not permit description of individual deposits, and the discussion is general, applying to ores in various localities.

Favorable Rock Formations

Fig. 1 is a generalized geologic column of the uranium producing region. The column on the right indicates beds which are known to contain uranium deposits. Most important producer is the Salt Wash member of the Morrison formation, the mainstay of the uranium-radium-vanadium industry for many years and which now yields about 60% of all domestic uranium production. Second in importance is the Shinarump conglomerate, which supplies about one-quarter of present production. In third place is the Chinle formation. Other formations contain less important deposits, as shown.

Partial List of Promising Exploratory Areas

- Inter-River District in Utah between the Colorado and Green rivers
- Western part of Navajo Reservation.
- Four Corners area in southwest Colorado and southeast Utah.
- Chuska District between Grants and Slickrock.
- South Central Utah.
- South of Austin, Nev.
- Kern River Valley east of Bakersfield, Calif.
- South rim of Wind River Basin in Wyoming.
- Area east of San Bernadino, Calif.
- Northern Black Hills area in Wyoming.

Sandstones Most Productive

Despite the wide geologic range of the ores, large number of host rocks, and scattered distribution of deposits over parts of four states, most of the ore is confined to a single type of favored host rock. This typical host rock is a fluvial sandstone, one which was deposited by streams rather than by wind or by sea water. Rock color may be tan, brown, gray, pink, lavender—in fact, almost any color except red. A particular rock unit which carries ore may be generally red, but the mineralized portions of the bed are some other color.

The sandstone usually contains carbonized fossil plant matter which may be in the form of logs or seams of coaly material or scattered flecks and films on the bedding planes. Rich ore is sometimes found with this plant matter. Feldspar or mica is usually present in small amounts; in other words, the typical host rock is arkosic sandstone.

Generally, sandstones which are lenticular and which interfinger with shale and mudstone are more favorable than thick, massive, clean sandstones. In western Colorado, for example, it has been found that areas where sandstones of the Morrison formation vary in thickness along the outcrop are more favorable for ore than areas where the sandstones are uniform in thickness. In the Lukachu-

Generalized Geologic Section Western Colorado and Eastern Utah

AGE	FORMATION	THICKNESS (ft)	CHARACTER	URANIUM PRODUCTION
EOCENE	Wasatch fm.	3,000+	Varicolored shale, sandstone and limestone	Minor occurrences
CRETACEOUS	Mesaverde fm.	1,000	Light colored sandstone and gray shale; coal-bearing	Minor producer
	Mancos sh.	2,000–5,000	Gray shale	
	Dakota ss.	50–200	Gray and brown sandstone and shale	Minor producer
	Burro Canyon	50–250	Light-colored sandstone, green and maroon shale	
JURASSIC	Morrison fm.	300–500	Brushy Basin shale member: varicolored shale and some sandstone	Minor producer
		200–400	Salt Wash sandstone member: light-colored sandstone and red mudstone	1. Most important producer
	Summerville fm.	50–400	Red and gray shale, thin sandstone	
	Curtis fm.	0–250	Glauconitic sandstone and greenish shale	
	Entrada ss.	50–1,000	Light-colored and red massive sandstone	Important vanadium producer; minor uranium
	Carmel fm.	0–600	Red earthy sandstone and gray shale	
JURASSIC	Navajo ss.	0–200	White sandstone	
	Kayenta ss.	0–300	Red sandstone	
	Wingate ss.	0–400	Red massive sandstone	
TRIASSIC	Chinle fm.	100–500	Red and red-brown shale and sandstone	3. Third most important producer
	Shinarump	0–100	Light-colored conglomerate and sandstone	2. Second most important producer
	Moenkopi fm.	0–1,000	Brown and red shale and sandstone	
PERMIAN	Cutler fm.	0–6,000	Light-colored sandstone and red and gray shale	Minor producer

kai Mountains of Arizona, the Salt Wash member of the Morrison formation changes character within a short distance from massive sandstones on the northwest, through mixed sandstone and mudstone, to massive mudstone with minor sandstone on the southeast (Fig. 2). Distribution of the deposits delineates an ore-belt which coincides with the sandstone and mudstone facies.

In prospecting new country, it is useful to keep in mind the type of rock which uranium seems to prefer. Much rock with favorable features is not mineralized, but most ore is mined from sandstone that has these characteristics:

1. Fluvial origin.
2. Light colored or gray; not red.
3. Contains carbonized plant matter.
4. Contains feldspar and/or mica.
5. Interfingers with or is interbedded with shale or mudstone.

Uplifts Attract Attention

A second guide to ore in new areas is the criterion that deposits may be found at several horizons in a single locality. This seems to be especially true if the locality is near an uplift. In the Grants, N. M., district, on the flanks of the Zuni uplift, uranium was first found in the Todilto limestone. The initial discovery touched off a wave of prospecting in the Todilto but some time later ore was also found in sandstones higher in the section, and now the largest known reserves of the area are in the sandstones. In another area of New Mexico, ore was found first in the sandstones and this directed attention toward the underlying Todilto limestone, in which significant mineralization was later found.

Recognition of the importance of uplifts was one of the factors which guided C. A. Steen to explore the Big Indian Wash, Utah, in the summer of 1952. Several multimillion dollar orebodies were located as a result of his exploration and through later work by others. Big Indian Wash is on the flank of the Lisbon Valley faulted anticline. Uranium deposits of small size and marginal grade had been known in the Cutler formation since 1948. Steen's discovery drill hole was located to intersect the Cutler ore zone, but cut, instead, an ore zone in the overlying Chinle formation. Ore worth more than $2-million was shipped from the Steen orebody in 1953.

In Big Indian Wash, like the Grants area, orebodies are known at several horizons in rocks which flank an uplift.

Seismic Shot Holes Yield Clues

A third technique which has paid off in new discoveries is the checking with a counter of seismic shot holes drilled during geophysical exploration for oil. The holes are on the order of 4 in. in dia and 150 ft deep. They are usually loaded with dynamite and shot shortly after being drilled. The amount of footage drilled by seismic shot crews looking for oil in the Colorado Plateau far exceeds the combined footage drilled by industry and Government in the search for uranium. Most of this activity is concentrated in the San Juan basin of northern New Mexico and in northeast Utah and northwest Colorado, but any area of sedimentary rocks may be tested.

Radioactivity of the holes can be checked in two ways. The hole can be probed with a Geiger counter which has a long connecting cable, or the cuttings can be checked with a counter. Probing the hole gives more complete information, but this necessitates a counter operator who is constantly with the drilling rig to take advantage of the brief period between the time the hole is completed and loaded with dynamite.

With the cooperation of the oil companies involved, the Atomic Energy Commission is currently checking holes drilled by several seismic crews, and this work has resulted in the discovery of uranium ore in several new localities. In one place ore was found

in holes drilled in the Morrison formation through a cover of wind-blown sand. In other localities discoveries have been made in the Eocene Wasatch formation and the Cretaceous Mancos shale.

Because the shot holes may be drilled in any sedimentary formation, logging them is a good method of wildcatting for uranium. The holes are being drilled anyway; checking them requires little additional expense.

Uranium in Coal

During the past couple of years, uranium has been discovered in coal beds at several localities. Most of this material has been below ore grade, but it is possible that certain coals may eventually be mined for uranium. One attractive feature of processing such material for uranium is the fact that when the coal is burned the uranium remains in the ash. Thus, it is possible to burn the coal for heat or power and effect a concentration of uranium at the same time.

For some peculiar reason, not yet completely understood, the usual commercial coals of bituminous and anthracite rank are not radio-active. The uranium seems to prefer, exclusively, the low-rank lignites and subbituminous coals. Another interesting fact, which has come out of work done by the Geological Survey, is that the uppermost bed of a coal series is usually the most radioactive. This suggests that the uranium was carried into the coal by waters that moved downward from the overlying rocks. In prospecting coals, then, the uppermost bed is probably the most favorable.

Airborne Prospecting

For initial reconnaissance of large, new areas, the airplane has proved to be a great aid. A slow-flying plane, a counter with high sensitivity, and a skillful pilot are required. Significant orebodies have been found by aircraft in many parts of the Plateau and in other parts of the country as well.

These, then are several techniques which have proved useful in finding uranium deposits in new localities—recognition of a favored host rock, checking for mineralization in several parts of the section near uplifts, logging seismic shot holes, prospecting for radioactive coal, and airborne reconnaissance.

Searchers Follow Trends

Probably the most widely applied guide in mineral exploration is the use of a recognized mineral trend. If several orebodies are aligned in a row a likely place to look for more ore, other things being equal, is along the extension of the line in one direction or the other.

The most widely recognized mineral trend in the Plateau is the Uravan Mineral Belt (Fig. 3). This is a zone in western Colorado and Utah where orebodies in the Morrison formation are larger and more numerous than elsewhere. Definition of the Uravan Belt has indicated areas of favorable ground where the ore-bearing rocks are at considerable depth. Deep drilling here has been successful in finding ore.

A mineral trend may, however, be an uncertain guide. The large-scale Uravan Belt trends northerly, but within it many orebodies are aligned along an easterly trend, transverse to the large belt. In drilling, the easterly trend of the orebodies may be more important than the northerly trend.

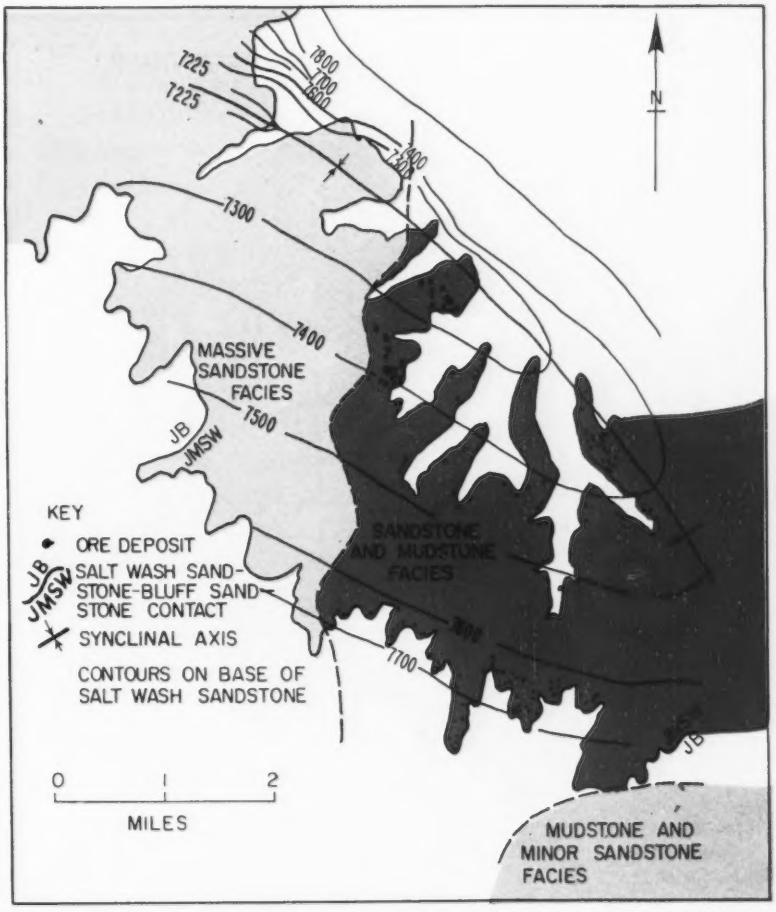


FIG. 2. NOTE HOW KNOWN OREBODIES are restricted to the mixed sandstone and mudstone facies of the Salt Wash sandstone in the Lukachukai Mt. area. This relationship is useful in finding new ore. (After Masters, AEC, RME-27).

How can one decide which trend to follow? Experience has developed one clue which is sometimes useful. In many localities there appears to be a connection between a mineral trend and the sedimentary trend—that is, the direction in which the streams flowed in depositing the ore-bearing sandstone. The sedimentary trend can usually be determined by careful mapping of the ore-bearing standstone to show sedimentary structures that reflect the direction of stream flow. These structures include cross bedding, ripple marks, and current lineation.[1]

Fig. 4 illustrates the use of a sedimentary trend in locating drill holes. The dashed lines indicate the outcrop of the ore-bearing bed. To the left, the ore bed has been removed by errosion; to the right, it is covered by younger rocks. Arrows indicate directions of

[1] The use of current lineation is discussed by W. L. Stokes in "Primary lineation in fluvial sandstones: a criterion of current direction," Journal of Geology, vol 55, pp 52-54, 1947.

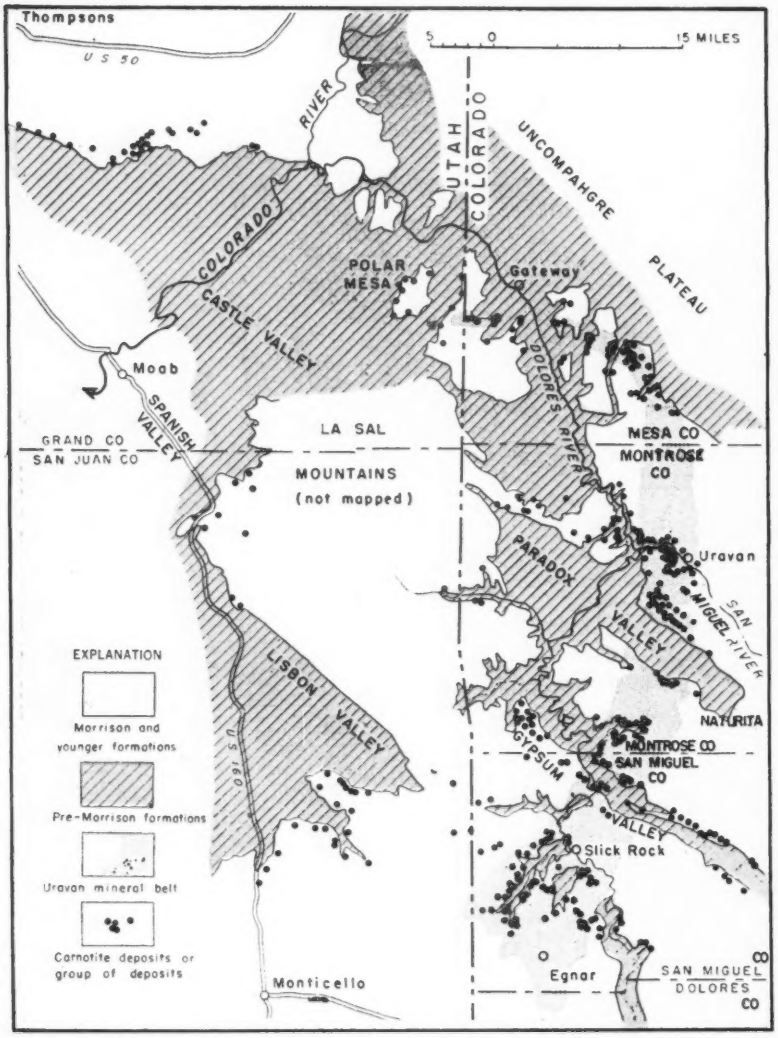


FIG. 3. DOTS INDICATE PRINCIPAL DISTRIBUTION of known uranium deposits in the Salt Wash sandstone in the Colorado and Utah portion of the Colorado Plateau. (After Fischer and Hilpert, USGS Bul. 988-A)

current flow based on many measurements of sedimentary structures. These directions are combined, by addition of vectors, to give an average direction of stream flow. Drill holes are located in the indicated direction away from a mineralized outcrop.

Logging Units Speed Search

A tool which has proved almost indispensable in drilling is logging equipment by which the radioactivity of a drill hole can be measured. This may be a geiger counter with the probe attached to a long conducting cable so that the probe can be lowered down the hole, or the equipment may be a complex, highly sensitive, self-recording scintillation unit. Either is designed to measure the radioactivity of the hole as the probe is slowly raised or lowered. A simple unit can detect the difference between barren rock and ore. Thus, it is useful in checking a hole where some of the core or cuttings have been lost. A more sensitive logging unit can distinguish between one kind of rock and another.

With highly sensitive scintillation logging units, it is possible to make contour maps of the relative intensities, in different holes, of subsurface radioactivity. Such a map helps to determine which drill holes, among a group of barren holes, have cut ground favorable for ore. In this way areas favorable for further testing can be delimited.

A third technique which has proved effective in guiding drilling is the preparation of maps showing various geologic features of the ore-bearing sandstone. These maps are similar to ones used extensively by oil companies in looking for oil, but some of their

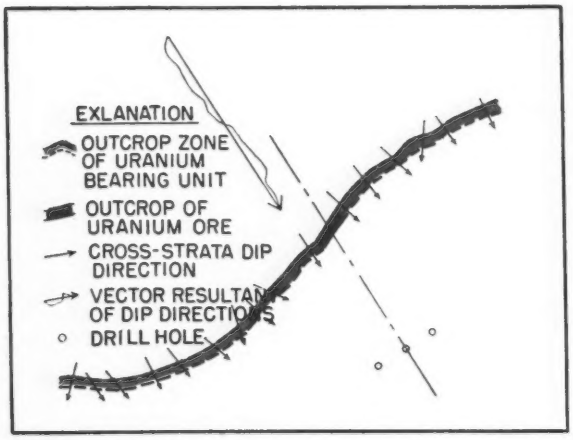


FIG. 4. SEDIMENTARY TRENDS shown by numerous vectors aid in projecting ore trends. (After Lowell, U.S. Atomic Energy Commission, RME-44)

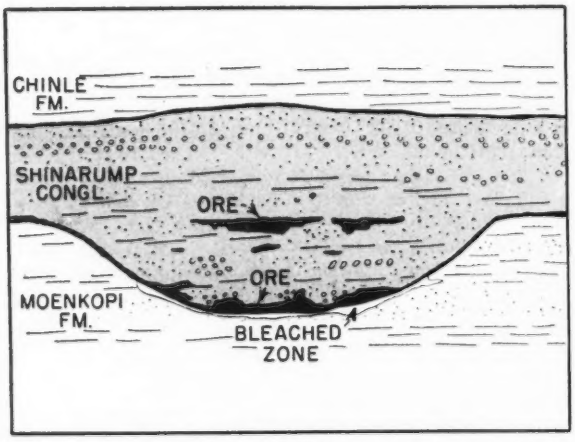


FIG. 5. IN THE WHITE CANYON area all known orebodies occur in Paleo-stream channels filled with Shinarump conglomerate. Not all channels are mineralized.

names may be rather unfamiliar in the field of mineral exploration: isolith, isopach, mudstone ratio, and structure contour maps. They are not specific guides to ore but, like pieces of a jig-saw puzzle, an assemblage of such maps provides a picture of subsurface geology which in turn increases the efficiency of ore finding. Two examples may serve to illustrate the method.

In the Shinarump conglomerate of White Canyon, Utah, the orebodies are in erosional channels which probably represent stream channels cut into underlying red beds of the Moenkopi formation and filled with Shinarump sandstone (Fig. 5). Not all channels are mineralized, but the ore is always within a channel. In drilling for these deposits, the first goal is to trace the channel; the second is to test it for mineralization.

Drilling can be guided by a structure contour map (actually a paleotopographic map) showing the configuration of the contact between the Shinarump and the underlying Moenkopi (Fig. 6). A survey of the contact on the outcrop and elevations determined for the contact in the first few holes drilled provide the data for the map. The trend of the contours suggests the general direction of the channel and indicates locations for more holes for channel tracing.

In drilling for ore in the Morrison formation of the Lukachukai Mountains, Ariz., maps showing the color of the ore-bearing unit have proved to be effective (Fig. 7). Red is the dominant color of the ore-bearing sandstone, but most of the ore is contained in gray sandstone within the red. By study of core or cuttings, contours can be drawn to show the percentage of favorable rock color within the ore zone. In the tinted area of Fig 7, less than 50% of the ore sand has favorable gray color; in the nontinted area, more than 50%. Orebodies are shaded. From a map such as this the trends of favorable sandstone can be recognized and drilled.

In conclusion, it should be noted that no ore guide is infallible; some orebodies are found in geologically unfavorable ground, and some guides have probably not yet been recognized. It is encouraging, though, that ore guides do work part of the time and deposits have been found through their use. More ore guides are being postulated and tested each year. As exploration in the Colorado Plateau is directed toward deeper deposits, geologic clues increase in importance.

H. E. Stocking offered many valuable technical and editorial suggestions incorporated in this paper.

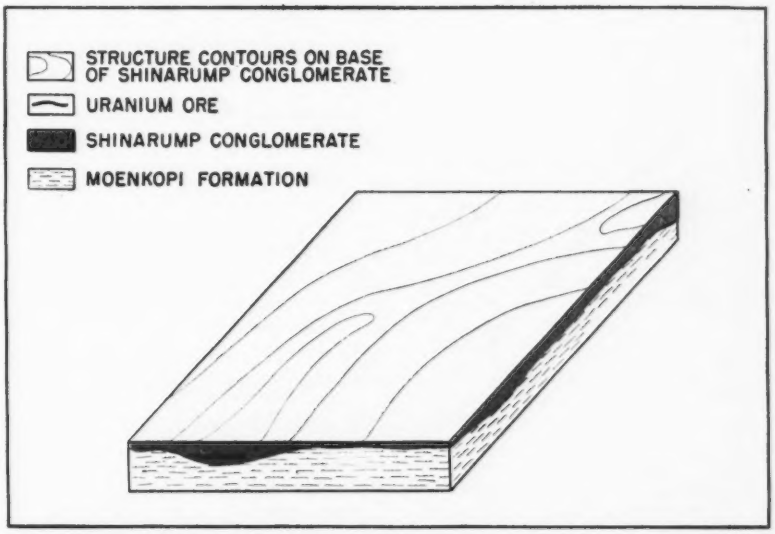


FIG. 6. STRUCTURE CONTOURS between Moenkopi and Shinarump, corrected for regional dip if necessary, aid in tracing favorable Shinarump channels.

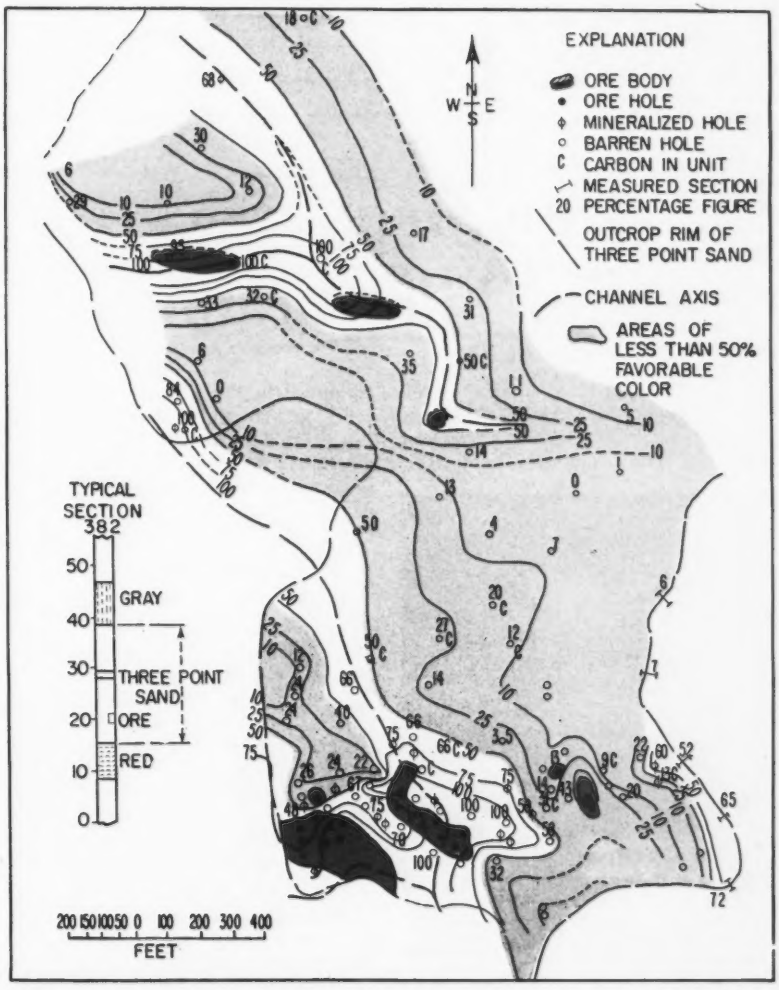
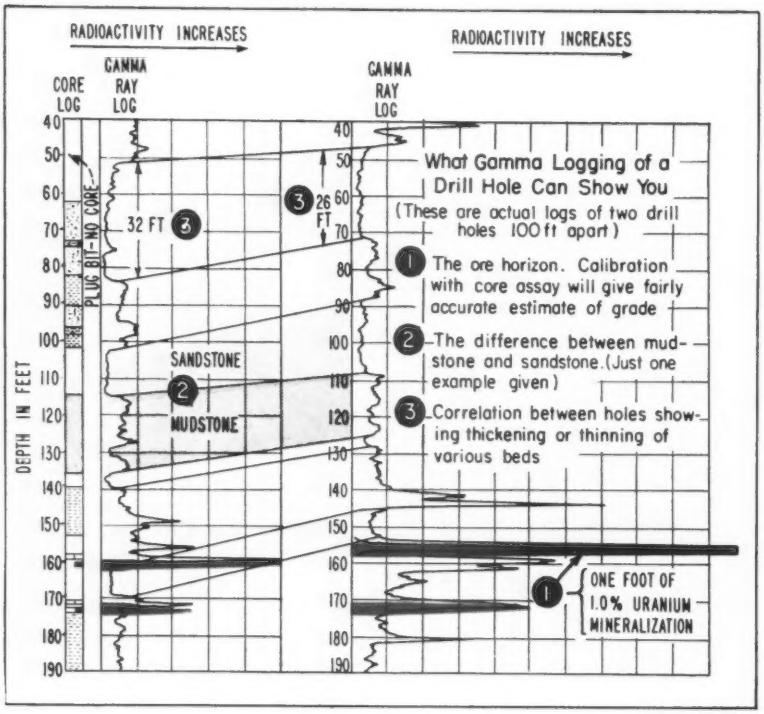


FIG. 7. COLOR OF SANDSTONE (grey is favorable, red is not) in Lukachukai area aids in finding favorable ore zones like white rings around target bullseye.


RADIOACTIVITY INCREASES
CORE LOG
GAMMA RAY LOG
DEPTH IN FEET
PLUG BIT
NO CORE
32 FT
SANDSTONE
MUDSTONE
RADIOACTIVITY INCREASES
GAMMA RAY LOG
26 FT
What Gamma Logging of a Drill Hole Can Show You
(These are actual logs of two drill holes 100 ft apart)
1 The ore horizon. Calibration with core assay will give fairly accurate estimate of grade
2 The difference between mudstone and sandstone. (Just one example given)
3 Correlation between holes showing thickening or thinning of various beds
ONE FOOT OF 1.0% URANIUM MINERALIZATION

How Geophysics Helps Find Uranium

RIGHT NOW practical application of geophysics on the Colorado Plateau is restricted to radiation detection methods. These methods have been employed in the discovery of almost every known ore deposit in the last few years. Limited use has been made of electric logging and seismic refraction techniques, but neither of these is in general use.

ROYAL S. FOOTE, Chief
Geophysical Exploration Branch
U. S. Atomic Energy Comm.

Radiation

A brief outline of the practical facts about radiation will serve to clarify the explanation of radiation techniques.

Uranium ore is radioactive because uranium disintegrates into a series of different radioactive elements. During the breakdown energy is given off in form of particles and rays. The most penetrating of these rays, the gamma ray, is detected to locate outcrops of uranium and to log drill holes which intersect uranium ore.

Gamma rays are similar to light rays except that they have more energy and can penetrate matter with greater ease. They will be cut 50% in intensity tunneling through approximately 400 ft of air. They will be stopped by 12 in. of barren sandstone, decreased 20% by ½ in. of steel, stopped by 30 in. of water.

Gamma ray detection is not entirely reliable because most of it does not actually come from uranium but from the elements formed by the disintegration of uranium. These other elements can become separated from uranium, and if this happens, gamma radiation can be detected when no uranium is present, or conversely uranium can be present with no appreciable gamma radiation observable. This is a factor to consider but it does not cause any great difficulty on the Colorado Plateau except in some Shinarump deposits.

Gamma radiation is measured by geiger counters and scintillation counters in the field. These instruments are usually calibrated in units called mr/hr. One mr/hr is the rate of gamma radiation that is observed at a distance of 28.98 centimeters from one milligram of radium. In field surveys very small increments of radiation may be significant. Increases may be on the order of 0.02 mr/hr, and reconnaissance instruments should be able to quickly detect increases in radiation rate of that magnitude. Normal scintillation counters will do this but ordinary geiger counters will not.

Radiation methods in exploration are applied in four ways on the Colorado Plateau; airborne reconnaissance, ground reconnaissance, drill hole logging and carborne reconnaissance.

Airborne Radiation Surveying

Airborne surveys were introduced in the AEC exploration program on a routine basis early in 1952 and since then have resulted in the discovery of many orebodies and have been extremely effective in guiding ground reconnaissance activity.

The most effective airborne technique has been the operation of small, single engine aircraft; flying close to the ground and recording radiation anomalies on aerial photographs.

Application: The method should be applied and areas flown only after evaluating geologic factors. It can then be used effectively to extend producing areas; extend known ore-bearing sedimentary formations; survey stratigraphic horizons designated as favorable by geologic staff.

Technique: Surveys can be made in two ways: In the first method, the aircraft flies a short distance from a vertical cliff on which a favorable formation is exposed. (This "Rim Flying" has been most productive method in AEC operation.)

Advantages are: (1) anomalies are accurately located; (2) anomalies can be partially evaluated by air (extent and trend can be outlined); (3) can cover selected formation and so coverage has more value per mile; (4) smaller anomalies can be detected.

Disadvantages are that: (1) limited area is covered per line mile; (2) aircraft have limited space and useful load; (3) may be hazardous in some areas.

In the second airborne surveying method the aircraft flies a grid pattern at high altitudes with flight lines spaced for percentage coverage recommended by geologic staff. (This is for areas of low relief and outcrops on a near horizontal plane.)

Advantages are: (1) cover more area per mile of flight; (2) can fly faster (3) can sample large area quickly for further work.

Disadvantages are: (1) cannot fly local selected formations; (2) anomalies are difficult to interpret and to locate accurately; (3) small anomalies can be missed.

In either method the aircraft must fly close to the outcrop (below 300 ft, best at 100 ft or below) and speed must be low (depends upon altitude but at 100 ft—not over 90 mph for survey).

It is valid to assume that the aircraft will be scanning a patch on the surface that is twice as wide as the height of the plane above ground. For most effective operation a geologist should be the aerial observer as he can partially evaluate radiation anomalies during flight. Final evaluation of a radiation anomaly must be done by a geologist on the ground after geologist-observer plots anomalies on aerial photos or photo index sheets as they are observed.

Limitations: (1) surveys should not be made in excessively high altitudes (preferably not above 10,000 ft); (2) effective flying cannot be done under extremely turbulent conditions (fly early in the morning, from just before sunrise to about 10 a.m.); (3) areas of extreme relief limit flying. This usually depends upon the judgment of an experienced pilot and is a function of wind conditions, accessibility of landing areas, etc.); (4) effective surveying cannot be done more than 500 ft away from the explored outcrop, at least not with appreciable success; (5) surveys are limited by weather conditions. (Low level flight is not safe except under ideal weather conditions, check seasonal weather characteristics for planning a survey).

Equipment: The aircraft should be chosen for flexibility of operation. It should have (1) service ceiling above 15,000 ft; (2) useful load of at least 1000 lb; (3) stability at low air speeds (around 50 mph); (4) cruising speed of reasonable rate (at least 120 mph); (5) high rate of climb; (6) good visibility.

Radioactive instrument dials should be removed to reduce background radiation level in the aircraft.

The detection instrument should be a scintillation counter able to show increments in radiation of 0.001 mr/hr in a fraction of a second. (The larger the crystal, the easier it is to detect small anomalies.) The instrument meter or indicator should give a very steady indication when no outside source of radiation is near it. It should be sensitive enough so that the meter gives a definite and steady increase in reading when gamma radiation rate is increased by 0.001 mr/hr. A recording milliammeter should be used to indicate radiation graphically for future reference. The recorder should have a fast response time (in any case faster than ½ second). Surveys can be made without a recorder but a record is desirable.

"As of December 1953, 75% of the ore reserves of the Edgemont District, S. D., were direct results of airborne discoveries."

Evaluation: With one aircraft surveying 50 hr a month on a combination of rim and grid flying in a favorable Colorado Plateau area, a reasonable expectation might be five anomalies a month. There is not enough information to definitely establish this but it is a reasonable estimate. There is no way to say how many of these anomalies will indicate uranium mineralization of commercial interest on the ground. This will depend entirely on the area under consideration and the care with which the survey is executed. There is no relationship between the size of an anomaly as obtained in the air and how much uranium ore is on the ground. Some anomalies are meaningless.

If an aircraft flies 50 hr of low level survey a month, which is a reasonable estimate for the Plateau, it can cover an area of 120 sq mi on a grid survey flying at 100 ft, or approximately 3000 line miles on a rim survey scanning a path on the ground that is twice as wide as the altitude flown.

Results of AEC airborne surveys include:

During a 12-month period, the AEC flew approximately 20,000 mi of survey and obtained 120 anomalies. 15 to 20 of these anomalies have since developed into producing properties.

As of December 1953, 75% of the ore reserves in the Edgemont District, S. D., were direct results of airborne discoveries.

Several large properties were originally detected by low level airborne surveying and have since developed into profitable mines with total reserves that may total $10-million.

Cost: Satisfactory detection equipment for airborne work can be obtained from at least eight commercial suppliers at a cost of between $2000 and $8000. A recorder is commercially available for $400. Satisfactory aircraft can be obtained from commercial suppliers for as little as $6,000. The specifications should be detailed by an experienced pilot, or with CAA. Additional costs will be incurred by ground checking.

Operating expense including cost, oil, aircraft maintenance, storage, pilot and observer salary—assuming flying time 70 hr per month will amount to approximately $3,000 a month per plane.

Drill Hole Logging

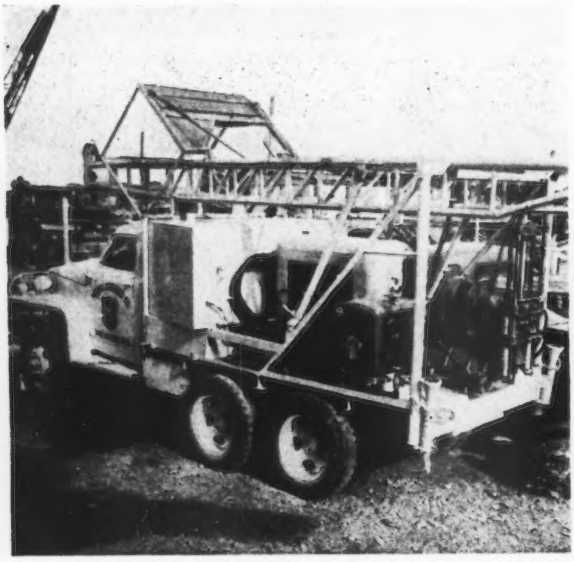
If an operator is drilling around 20,000 ft a month, routine gamma logging is mandatory for economic operation in the Plateau. Essential information can be gained and it will be necessary to core fewer ore holes per drilling area by using gamma logging techniques.

It will pay to plan drilling projects with gamma logging as one of the drilling factors. The planning should be done considering local geology and previous drilling problems in the area.

Application: For economic operation *every* non-core hole must be gamma logged. Sampling of cuttings is not sufficient and if this technique is relied on ore will be missed. On one Plateau drilling project, ore reserves were doubled on the basis of gamma logging of non-core holes where previous reserves had been estimated by analysis of cuttings.

If drilling is to be a continuous part of your operation, be sure to: obtain a good scintillation logging instrument; assign one logging operator and one geologist, familiar with the Plateau to supervise and apply the gamma logging technique; lay out a procedure

(*Concluded on p 109*)



COMPLETELY INTEGRATED diamond drill unit of Minerals Engineering Co. includes water tank, mast, drill, air compressor and diesel engine.

ROTARY PORTADRILL at Jackpile property puts down 4¼-in. dry exploration holes. Cyclone unit recovers drill samples which have proved to be very reliable.

Private Industry Steps Up

AEC'S OBJECTIVE to encourage private industry to undertake a greater share of exploratory and development drilling on the Plateau is bearing fruit. During the period 1948 through 1953, the AEC and USGS drilled about 3.5-million ft[1], and private enterprise drilled a like footage. For fiscal 1954, however, it is estimated that private enterprise's 2-million ft will about double the footage drilled by contractors for AEC and USGS.

Most of the Government drilling is diamond drilling, with specification that a certain percentage be cored. An expanding percentage of Government drilling is rotary, but percussion drilling remains low. The object of most Government drilling is to explore geologic trends and seek new orebodies. Only a small portion attempts to delimit orebodies. In general the Goverment does pioneer work in new or relatively unknown areas, or does sufficient work to disclose the presence of ore in known areas where the financial risk is too great for private industry to undertake initially. But as one AEC official put it, "If private industry is willing to move in, we move out."

During the period of July 1, 1953 to Jan. 1, 1954, 60% of the drilling done by private industry was percussion drilling, indicating a main effort to delimit orebodies.

Core drilling is required to work out geologic information such as structure, Paleo-stream delineation, thickness of key beds, etc. Non-coring drilling is useful in delimiting orebodies, and is generally cheaper and faster. Both types are used by companies doing their own exploration work. For instance, Anaconda contracts diamond drilling to obtain geologic information from cores on wide-spread intervals at the Jackpile operations in New Mexico (centers 100 to 400 ft); but non-coring rotary drill holes on centers varying from 15 to 50 ft prove reliable to determine grade and extent of ore. Gamma-logging equipment is greatly enhancing the value of non-core hole drilling, and new types of geophysical logging equipment promise to yield even greater information from non-cored drill holes.

"You don't buy footage. You buy information!"

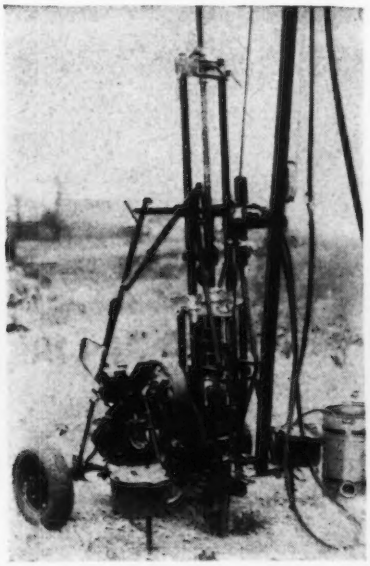
That is the concept of Moab Drilling Co., now entering the contract drilling business, according to Charles Steen. A complete "one-stop" drilling service is being developed to include mapping, geologic interpretation, drill-hole logging, good core recovery in the ore horizon (95 to 97%), and conservative ore-reserve calculations.

Stiff competitive bidding has forced virtually all drilling contractors to improve techniques and equipment to stay in business on the Plateau. Exploration campaigns now tend to demand faster drilling, lower costs, deeper holes, larger cores with high percentage of recovery, and fast dry drilling with good sample recovery. Drill contractors are meeting these demands.

Diamond drilling speed according to AEC estimates has been increased from an average of 50 ft per rig per day several years ago to a current average of 70 ft per day. Dry rotary drilling units with dust collectors are averaging 500 ft per rig per day. Dry percussion drills in relatively shallow formations average about 500 ft per day. One company using deep-hole Mayhew rotaries sets its bonus base at 300 ft per shift with water, and 400 ft per shift drilling dry. Under this system a 25,000-ft contract was wrapped up in 30 days, using two shifts.

Many types of drills are in use on the Plateau including wet and dry rotary units, wet and dry diamond drills, dry percussion drills, churn drills, and a new light prospector's drill (Hossfeld) which combines some

[1] "Public and Private Activities in the Uranium Industry" by Quentin L. Brewer, Deputy Director, AEC Exploration Division.



NEW LIGHTWEIGHT HOSSFELD DRILL stirs interest of prospectors on the Colorado Plateau.

TANK TRUCK and large compressor enable Moab Drilling Co. rotary rigs to drill holes wet or dry.

DUCON DUST COLLECTOR to be installed on Minerals Engineering dry-drilling rig is an effective sample collector.

Plateau Drilling

principles of the churn drill and the percussion drill. Diamond bits, both coring and non-coring range from EX to NX. Tungsten carbide insert drag bits, hard-metal finger bits of the Hawthorne types, and tri-cone type bits are used on rotary rigs. Both steel and tungsten-carbide bits are used on percussion drills.

Newer drill rigs are equipped to switch from air to water in a matter of minutes. Once you strike water in the drill hole, dry drilling is out. However dry drilling is preferred to make time through barren formations.

Maximum core recovery in the ore zone is the target of most drilling. In difficult ground, drill contractors try various types of double-swivel type barrels with inner tube suspended on bearings to reduce the amount of core loss. For non-core samples, the Ducon dust collector and similar units yield as high as 97% recovery.

Among items that run up drilling costs on the Plateau are the following: (1) lack of handy water. Sometimes a haul of 100 miles may be necessary; (2) access roads. They may have to be bulldozed and blasted over rugged cliff faces.

Plateau drilling problems and techniques were covered thoroughly in a Drilling Symposium held Oct. 8-10, 1953, at the University of Minnesota in which drilling authorities from Government and industry participated. No attempt will be made here to duplicate that excellent coverage, but the following interesting developments are reported to round out the pictures.

Prospector's Drill. A new lightweight prospector's drill has been introduced by the Hossfeld Manufacturing Co. (See illustration) The drill can put down holes to 110 ft at 5 to 15 ft per hr with a two-man crew. It runs all day on 2 gal of gas and 2 to 3 bbl of water. Delivery cost with 70 ft of steel is about $1375. Weight is 1100 lb. About 21 Hossfeld rigs are now working on the Plateau.

Horizontal Drilling. Walter Verner of Uranium Engineering Co. reported the successful use of percussion drills for horizontal exploration in the Lukachukai area. Holes up to 60 ft were drilled at the rate of 3 a day. Costs ran 45 to 78c per ft.

Oil-Well Type Rotaries. At one time all but four of the 21 drilling rigs active in the Big Indian Wash area were Mayhew rotaries, indicating the acceptance of this type of equipment for uranium exploration. Moab Drilling Co., which has five drills, uses both rotary bits and coring type diamond bits. The drills can be switched from air to water in a matter of minutes, depending on the ground. Cores yielded from the 4½-in. dia bits are 2½ in. in dia. Core recovery runs from 95 to 97%. Holes 800 ft deep are considered routine by Moab.

Rigs are equipped with auxiliary power for pumps in case of main-engine failure. This prevents sticking a drill string. Installation of two-way radio has been a profitable investment. At the present time Moab Drilling Co. quotes a flat $4 per ft price whether the hole is 500 or 1000 ft deep, with guaranteed core recovery in the ore zone.

Diamond Drill Rig. Minerals Engineering Co., veteran drilling contractor on the Plateau, has progressively improved its drill-truck units until they now include a folding mast (see illustration), independent motor to run drill, compressor, water tank, diamond drill, and jack spuds mounted on the truck bed. It takes only 20 min to set up the mast and get going.

Dry-Rotary Drill. The Portadrill (see illustration) unit now in use at Anaconda's Jackpile property puts down 4¼-in. dia holes using 15 lb pressure air at 414 cfm for holes down to about 120-130 ft. Footage drilled per day runs about 400. Samples from the cyclone-type dust collector give reliable information on ore values. The Portadrill unit is faster and used for short interval holes, while diamond drilling is used to obtain widely spaced cores for geologic study.

General Observations. Mining of drilled-out orebodies yields on an average 25% more ore than indicated by drilling but 10% lower in grade. Price most frequently cited as average for diamond drilling is $4 per ft. Rotary drilling costs about $1 per ft for depths of 300 ft and as much as $4 per ft at 1,000 ft. For complete drilling costs turn to p 115 which lists mining and exploration costs.

AT ANACONDA'S JACKPILE MINE, ore zone in lowest bench calls for highly selective mining with shovels and trucks. Upper two benches are in waste.

PILOT HOLE in back of North Jackpile adit was put in with 36-in. auger.

Uranium Mining Demands Skill

WHEN PLANNING a Plateau mining operation the most important objective is grade, not tonnage. Successful veteran miners in the area are more apt to talk about pounds of uranium produced rather than tons of ore; and they suggest that tonnage should seldom be boosted at the expense of grade. A quick look at the ore-buying schedule of the AEC, p 111 will convince you that it is much more profitable to ship one ton of 0.30% ore, than 2 tons of 0.15% ore.

Special emphasis must also be placed on selective mining because many Plateau orebodies have a tendency to pinch in and out ("inner-and-outers" is the local term), swing up into the back, or dive down below the working face, and grade may vary so drastically from one face to another that you have to feel your way ahead of blasting and loading with a geiger probe to prevent dilution. All of this challenges the ingenuity of the best of Plateau miners, many of whom are trying out ingenious variations of open stope and open-pit methods.

Some ore is extracted by underground methods, some by open-pit, and some by both. Equipment may vary from a No. 2 scoop shovel and a wheelbarrow to a 2½-yd power shovel and dump truck. Both trackless and track-type loaders and haulage units are widely in evidence.

"Don't over-mechanize!" is a final word of warning from experienced producers, particularly for small and extremely irregular orebodies. Oversize equipment requires large and costly working faces, and causes profit-cutting dilution.

The following case histories show how some of the progressive operators are solving Plateau mining problems:

I. Open-Pit Mines

Anaconda's Jackpile Mine. Here we see a fine example of selective open-pit mining of an irregular orebody. Extent of the orebody was first defined by drill holes, and later verified by extensive underground headings and raises on drill holes. Underground exploration yielded two vital types of information: (1) an accurate picture of the orebody on which to base plans for a mining method, and (2) sufficient test tonnage to establish grade of ore and amenability to milling.

Since the ore is overlaid by 100 to 120 ft of overburden, the advantages of open-pit vs underground methods had to be weighed carefully. Open-pit mining won out for two reasons: (1) irregularity of the ore horizon indicated that underground mining would be difficult, and (2) open-pitting, while not necessarily cheaper, offered the advantage of complete extraction with opportunity to stockpile ores not destined for immediate shipment.

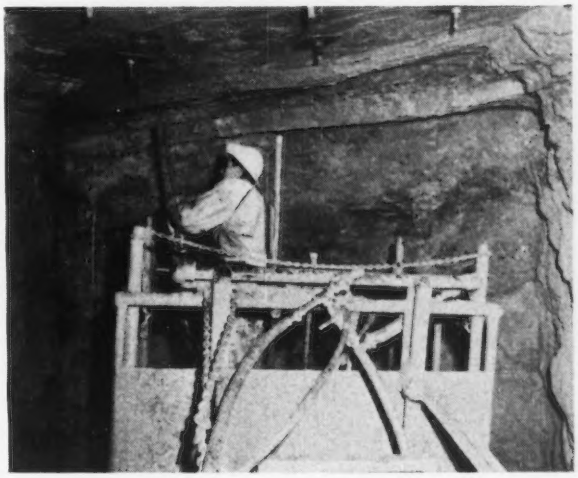
Anaconda delegated the job of overburden removal to the Isbell Construction Co., and focussed its engineering and mining talent on the 15- to 30-ft ore zone below the overburden. The ore bench exposed at the time of *E&MJ's* visit revealed about 10 ft of lean sandstone ore covering a 6- to 8-ft diabasic sill which was underlaid by about 6 to 8 ft of shipping-grade ore.

Grade of ore had been determined ahead of mining by probing a grid of jackhammer and blastholes with a geiger counter. A working sketch to guide blasting and loading operations was then made. Broken ore was loaded under extremely close supervision. High-grade ore was shipped to the mill at Grants. Low-grade ore went to one stockpile, medium grade to another, and value-containing sands in the barren dike rock were removed by an ingenious system called "shovel classification." Here the shovel operator makes several passes through the broken bank with shovel gate open. This permits the fines to segregate to one part of the bank, while the barren coarse rocks settle in another. The sands went to an appropriate stockpile, while the dike rock went to waste. This technique effected an 85-90% separation, and represents just about the nth degree in selective open-pit mining.

Overburden was drilled out in two benches. The upper bench (50 to 60 ft thick) was drilled with 8½-in. churn drills to permit more concentrated loading of powder in the bottom and middle deck of the hole. Smaller holes resulted in formation of a bank that endangered shovel operations. The lower bench responded to smaller hole drilling and was being drilled for blasting with a 6¼-in. Portadrill rig.

VCA's Monument No. 2 Mine. Like

VCA'S LARGE MONUMENT NO. 2 MINE exposes ore on two levels. "Panel" open-pit method is now being used.



MASSIVE OREBODY at Steen's MiVida mine requires roof bolting, heavy trackless jumbos, front-end loaders and trucks.

the Jackpile, Happy Jack, and Steen's MiVida property, this is one of the major discoveries on the Plateau during the past five or six years. The orebody lies in a rather broad Paleo-stream bed about 50 ft thick in the middle and thinning to knife-edges on the sides. Overburden consists of about 20 ft of sandstone. Generally the ore occurs on two irregular horizons separated by about 20 ft of waste, and thins out at the edges of the deposit.

Extent of the orebody was determined by headings extending from one side of a peninsula-like mesa point to the other. About 50% of the ground mined was left as pillars. Open-pit mining was then adopted to get 100% extraction. At the time of *E&MJ*'s visit, open-pitting was being pushed vigorously across the Paleo-stream axis by a highly-selective "panel-mining" system. Overburden and interlying waste bands were bulldozed aside in 30- to 50-ft panels. Exposed bands of ore were then removed by a closely supervised sequence of drilling, blasting, and loading. Loading was generally done with front-end tractor units, but if necessary pick and shovel methods were used to clean out isolated thin seams or pods of high-grade.

Intermediate- and low-grade ore encountered will be extracted and concentrated in the first large attrition mill to go up on the Plateau. Details of the mill now under construction at VCA's Monument No. 2 are as follows: ratio of concentration will be 3:1; equipment installed will include a primary crusher, rod mill, classifier, thickener, filter, and dryer. The mill product will be dried to 15 to 20% moisture content, and shipped in containers for blending with feed to VCA's Durango plant. This marks one of the first major efforts to scour uranium-rich slime coating from barren sands, and may contribute much toward solving a Plateau problem.

II. Underground Mining

Steen's MiVida Mine. The trackless haulage system at this fabulous mine has been adequately publicized.[1] But it is well to emphasize that the front-end loaders, Dumptors and trailer-tractor haulage units, mechanical drill jumbos, and modern roof-bolting rigs at this mine show that Plateau operators are quick to adopt modern trackless mining units if the nature of the orebody warrants this degree of mechanization. Similar highly-mechanized trackless equipment is employed by Climax Uranium[2] and Minerals Engineering Co. in its contract mining operations.

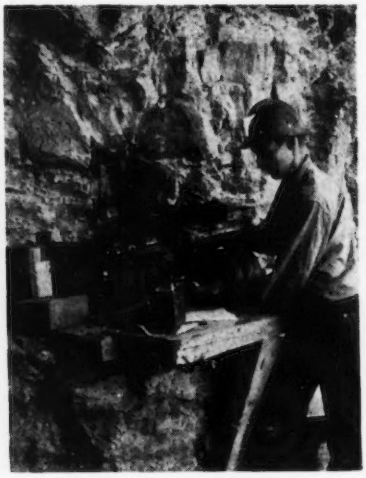
At the same time it should be pointed out that Homestake's Little Beaver operation, and Standard Uranium's operation near the Steen mine are attacking the ore with track-type mining equipment including side-dump cars, storage battery trammers, and mechanical over-cast loaders. Charles Steen told *E&MJ* reporters that he will be very interested to see how the track-type costs will compare with the trackless-mining system—indicating a perfectly open-minded willingness to study and adopt the system that does the job best.

Consolidated Uranium's Calyx-Hole Shafts at Temple Mt. A generous scattering of 36-in. calyx-hole cores on the east flank of Temple Mountain's productive Shinarump horizon (over $2-million to date) is ample evidence that Consolidated Uranium Co. has found it profitable to get at the ore through small diameter circular shafts. Cost of sinking these shafts is reported to be about $30 to $40 per ft. This appears to be considerably cheaper than crosscutting from one orebody to another as delineated by drilling. Of course, station cutting from a 36-in. dia shaft presents some problems, and operators say that this is no place for a man who is even remotely affected by twinges of claustrophobia.

Anaconda's Unique Entry at the North Jackpile. As in the main Jackpile operation, Anaconda is preluding mine development at its North Jackpile property in the Laguna Reservation with a systematic underground exploration program to determine extent, grade, and amenability of ore to milling before adopting mining methods. Anaconda's mining staff anticipated that portalling an incline adit to contact the ore would involve a certain amount of shattering of the sandstone cliff and subsequent costly timbering to hold the portal. So the engineers tried out a 36-in. auger drill unit which had been used for coal exploration elsewhere in the area. With this unit they drove a 34-ft pilot hole inclined at 8½ deg in two days. By blasting to this relief back-hole the danger of portal shattering was prevented.

Subsequently a 253-ft, 8x10 adit with arched back to prevent slabbing, was driven in 10 days to contact the ore zone. This was driven by three shifts per day consisting of two drillers, a helper, and a Traxcavator operator. When the incline hit ore and branched out, roof bolts were installed in back and ribs to support ground at the Y.

CALYX-DRILL CORES at Consolidated Uranium operations near Temple Mt. are removed for small development shafts (right) used to mine many small orebodies.



TRAMMER AT PICK'S MINE checks each car with calibrated geiger unit.

An added advantage of the arched roof entry is that it affords space for air, water and ventilation pipes, and allows headroom for the tractor operator—at the same time assuring the ground stability that arch-openings are known to offer.

Anaconda's Woodrow Mine. This breccia-pipe deposit discovered by airborne radiometric survey is situated near the North Jackpile mine. The orebody was developed by sinking two 36-in. calyx holes 100 ft apart and 100 ft deep. The two holes were connected by crosscutting, and one was enlarged to form a two-compartment 5x10 ft shaft for hoisting. Mining of the breccia pipe is still under study, but it is thought that a panel mining system from top down will be advisable due to the unconsolidated nature of the orebody.

Summing It Up

The following problems, peculiar to Plateau mining, are worth serious consideration:

Ventilation. Possibility of a radon hazard is recognized by mining operators and Public Health authorities. Fortunately, however, no evidence has turned up to date indicating that radon has proved harmful to mine workers. Nevertheless, companies are requiring periodic health check-ups to make sure that this hazard does not exist. Opinion of operators is virtually unanimous that if you provide enough ventilation to eliminate excessive dust concentrations and diesel exhaust, you automatically whip the radon hazard.

Bore-hole ventilation with centrifugal exhaust fans on the surface is very popular in the uranium mines. Recently MiVida has drilled 2-ft dia rotary drill holes to exhaust mine air.

Small Mines. Companies seeking only large properties for future investment and production will do well to alter their objectives and consider group operation of small mines, first because uranium is more apt to occur in small orebodies, and secondly because several small properties can be regarded quite profitably as widely separated stopes, and operated under common supervision and with equipment from a common pool. Consolidated Uranium operates the Temple Mt. group of calyx-shaft mines under this concept, and experienced uranium producers say that it is entirely sound.

Then, too, remember that the AEC offers a bonus for initial production of uranium ore from new properties which doubles the base price paid for the first 10,000 lb of uranium produced. (MiVida collected $35,000 under this provision). Accordingly, production from five new mines can prove vastly more profitable than concentrated production from just one property.

Backfill and Retreat. Examination of many flat ore deposits in the Plateau indicates that best method of extraction is to advance by room and pillar to reach the limits of your orebody, and then retreat by something akin to long-wall retreating in the coal industry. Most of the mines you see today are in the advance stage, and many abandoned ones show barren pillars, but no signs of retreat. However, veteran uranium producers like Denny Viles of VCA can assure you that retreat with virtually complete extraction is entirely possible by using cribbing and rock fill, timber, or roof bolting for temporary support as you work your way out.

The AEC is not completely sold on the idea that lessees of Government holdings guarantee complete extraction. So the Commission prohibits, except with prior approval, backfilling with waste in order to allow re-entry and possible future mining of remaining values. This position is quite justifiable because smart leasers have been known to mine, and even re-mine, abandoned properties at profits measured in the thousands.

Extraction-Exploration Problems. One of the baffling problems of uranium mining is the need to find new ore reserves, almost as fast as you mine the existing ones. Exploration-development therefore is a necessary part of mining, and in the words of one veteran, "if you get down on your development, you cut your throat."

In rim-adit operations, it is both feasible and advisable to keep as many working faces open as possible, and to divert mining work to development and exploration when the number of working faces drop off.

Three schools of thought exist: (1) that it is best to drill out and delimit and orebody completely before mining; (2) that it is cheaper to develop ore as you mine it; and (3) that it is best to prove enough ore to justify opening the mine and continue exploration at a rate consistent with extraction. All methods have their place, and the choice depends upon depth of overburden to be drilled, and your ability to know where to look for more ore once you hit the productive horizon. The Atomic Energy Commission, recognizing this basic problem, has prudently provided a development allowance (under Circular 5) for 0.50c per lb of U_3O_8 contained in acceptable ores. Producers who ship more than 1,000 tons per year must certify expenditures for development work.

Maintaining Grade. In yellow carnotite orebody such as VCA's Monument No.2, experienced operators can estimate ore values visually. The old rule "If you see yellow, you've got ore," holds very well.

But in other mines such as Vernon Pick's San Rafael Swell property, you must rely on geiger counters and probes to guide you. At the Pick mine, each carload of ore is sampled. The sample is placed in a plastic container of specific volume, and inserted into a thick lead shield. Here it is geigered with a calibrated unit, and compared with a standard sample of known grade. Results of this scanning tell the miner whether to dump the carload in the ore or waste bin. To date these rapid radiametric assays have checked within .02% of the mill assays.

Indian Labor. Since some of the richest uranium deposits lie on Indian reservations (Jackpile, Monument No. 2, Lukachukai), operators of these units employ Indian labor for everything except top supervision and skilled mechanical work. Both the Navajos and Pueblo Indians are willing and capable workers, and operators point out that they are spurred by a double motive—wages, and royalties which go to tribal coffers.

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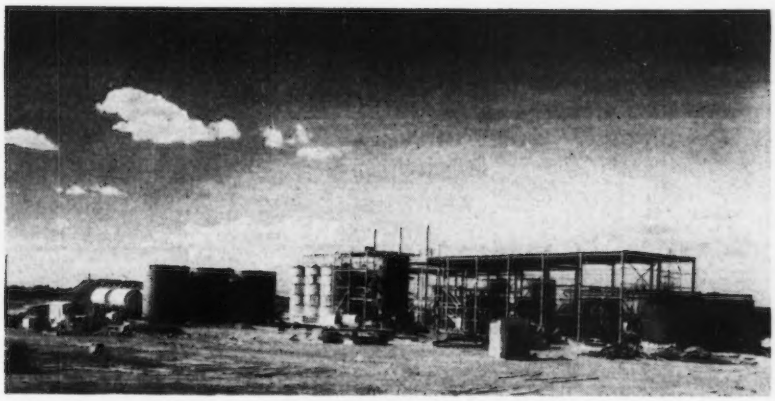
[1]USBM Information Circular 7669 by Steen, Dix, Hazen, and McLellan. "Big Boom at Big Indian" by Burt Meyers, *E&MJ* September 1953.

[2]"How to Make Uranium Mining Pay More" by A. Knoerr. *E&MJ* January 1952.



NEW KERR-McGEE uranium plant at Shiprock, N. M., is scheduled for operation later this year

How to Get Into Milling

PROFITS CAN BE MADE in milling uranium ore. One plant did have difficulty for a short period after starting up, but for all practical purposes, if recovery is maintained, the main difficulty that might put mill operations in the red is lack of ore.

Right now, lack of ore is no problem. Expansion of mill capacity has been unable to keep pace with the terrific rate of discovery and rock is literally piling up at the mills. Effort expended by the AEC to expand capacity is reflected in the experience of E. H. Crabtree, deputy manager of the Grand Junction AEC office, who is working overtime with potential operators, and one day was carrying on negotiations with three parties almost simultaneously. Despite the expansion of mill capacity, planned or underway, if discoveries continue to be made at the present rate, ore will continue to swamp the mills, a condition not without its comforts.

This pressure for more mills is attracting many competent firms to the Colorado Plateau, but not everyone may build a mill. There's no point in building a mill if you can't sell the concentrates, so as the only market for the concentrates, the AEC effectively decides who will build a mill and where. If you want to build and operate a mill, here are the factors that the AEC takes into consideration.

What AEC Requires

1. You must have at least half of the ore supply for the proposed plant tied up securely for five years. This safeguards companies that invested money in new plants at the invitation of the AEC when mills were even more sorely needed, by deterring cutthroat bidding for ores.

The AEC encourages potential mill operators to think in terms of a 200-ton per day mill as the minimum practical size, although this is by no means a limit—merely advice based on experience. What it means to you is that half of the required 5 years' reserve for a 200-ton mill amounts to about 180,000 tons of ore in the ground.

2. You must demonstrate your company's technical know-how. You may use any process you wish in the proposed plant to produce a suitable uranium concentrate, but U_3O_8 recovery and costs must be in line with experience at existing mills and in AEC pilot plants. Processes developed by the AEC or its contractors can be made available.

3. You must be financially responsible. The AEC does not lend money for the erection of concentrating plants.

4. If the first three conditions are met, your next step is to submit a firm proposal giving details on cost of plant, cost of operation, and metallurgical data. This may sound like red tape, but actually, these are figures that any mill man would put together anyhow. As a matter of fact, one well known mill operator, engaged in negotiations with the AEC, stated emphatically that it was a pleasure to deal with "the fellows from the Processing Division" because they knew their business and would handle any reasonable argument fairly.

Economics of Milling

Costs of erecting uranium mills, in terms of unit capacities, are not available, but uranium mills are said to come higher than comparable plants treating other metals. A good guess would be $10,000 to $15,000 per ton per day. Accelerated amortization can be obtained.

5. The final step is negotiation of a contract which calls for the AEC to purchase concentrates for a given period, usually 5 years, at a fixed price. The price is dependent mainly on operating costs. Here the AEC treads the narrow path of seeing to it that the taxpayers' dollars buy as much U_3O_8 as possible, while ensuring that the mill man gets a fair return on his investment.

What is a fair return? This figure is never revealed, but an unofficial estimate places it between 10% and 15%.

If we assume that the mill operator makes a profit of $1.50 per lb of U_3O_8, we bring to light a point of economics that should interest the miner as well as the mill man.

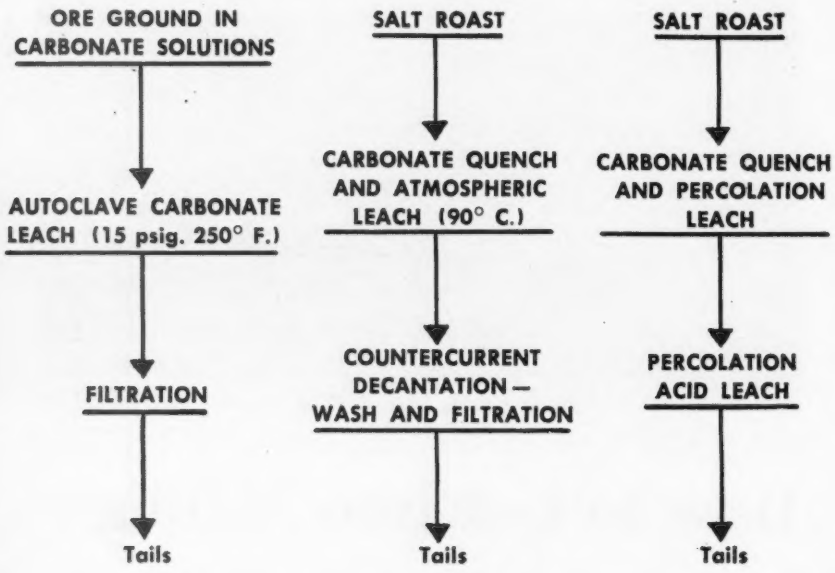
Suppose a miner ships 0.2% ore. This ore contains 4 lb of U_3O_8. To avoid the classified subject of uranium recovery, let's assume that the entire 4 lb is recovered. (Recovery probably doesn't vary very much with grade within the range of this discussion.) At the assumed profit of $1.50 per lb, the mill makes $6 per ton on this ore.

Another miner ships 0.55% ore; 11 lb of U_3O_8 per ton. At $1.50 profit per lb, the mill makes $16.50 per ton on this shipment. The difference is $10.50 per ton which makes it easy to see why a mill can afford to pick up at least part of the miner's haulage tab if his grade is high enough and the haul is long. Remember—the official prices for U_3O_8 as listed in Circular 5 Revised are minimum prices.

Chief fly in this ointment of economics is uranium metallurgy. There are many types of ores available on the Plateau and any given mill cannot treat them all economically no matter what the grade. Moreover, metallurgy is complex and feed must be watched carefully if recovery is to be maintained.

To analyze the problems of uranium metallurgy, we have called upon William Lenneman, metallurgist at the Grand Junction office of the AEC. On the following pages, he tackles the problem of getting uranium into solution from the ore, which is not within the bounds of security information. While problems exist in recovery of uranium from solution (many of the techniques which are, or can be used are classified), once uranium is in solution, the toughest part is usually over. Turn page for the story on the leaching of uranium.

Leach Circuits Used by the Uranium Mills of the Colorado Plateau



How to Extract Uranium from Ores

William L. Lennemann*
Metallurgical Engineer
Grand Junction Operations Office
U. S. Atomic Energy Commission

Solubilizing of the uranium mineral is necessary for the production of a crude uranium concentrate from the uranium ores found on the Colorado Plateau and has frequently involved a certain amount of difficulty and special consideration. Once the uranium is put into solution, there are effective methods for recovering it, either selectively, or as a sludge or precipitate brought down by pH adjustment of the uranium bearing solution. This sludge or precipitate can then be further treated chemically for the production of a high grade uranium concentrate. There are also problems in uranium recovery from solutions: problems of techniques and economics, problems of slimes and liquid-solid separation, and problems of upgrading the initial uranium bearing precipitate. However, generally speaking, once the uranium is in solution it should be considered as "in the can."

There are many methods of academic and experimental interest for solubilizing uranium, however only those commercially applied or those that pilot plant work has proved to be commercially applicable will be considered. These are essentially acid leaching and carbonate leaching. The chemistry is shown on p 107.

Acid Leaching

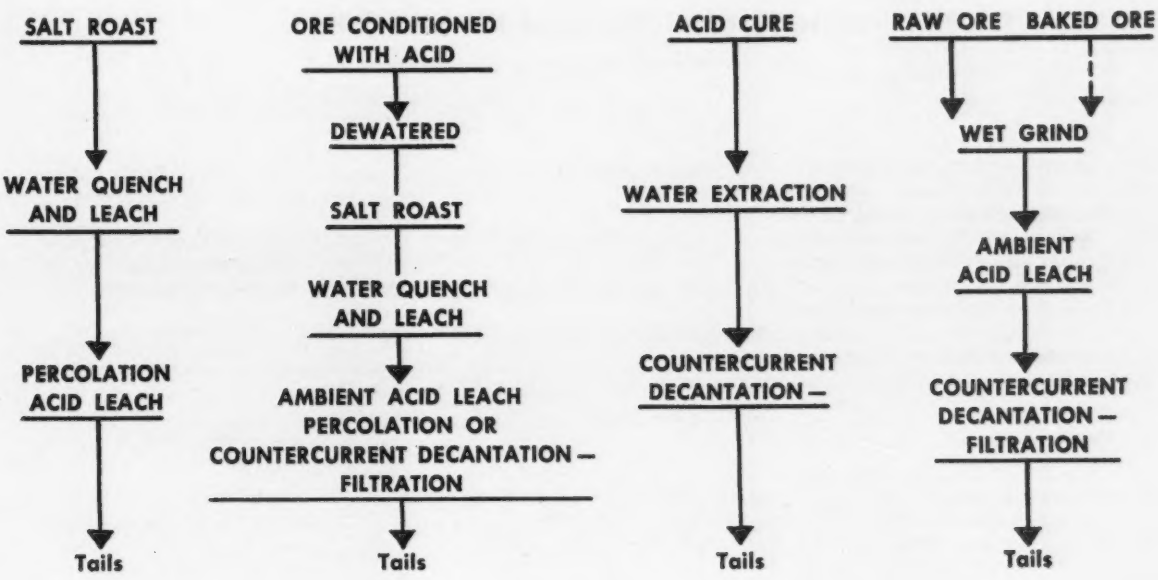
Because of its economic advantage, sulphuric acid is generally used for the acid leaching solution on uranium ores. Some of the uranium ore processing mills recover hydrochloric acid from salt roasting vanadiferous uranium ore and utilize as much of this hydrochloric acid as possible in the mill circuit.

Both nitric and hydrochloric acids solubilize uranium as easily and in fact, in many cases, do this better than sulphuric acid; however, the large quantities of acid necessary, the cheaper price, and general availability of sulphuric acid offset any small disadvantage in extraction. For that reason, only sulphuric acid will be considered in this discussion.

Most raw uranium ores not having a high lime content will give from 95% to 98% uranium extraction when acid-leached with a suitable oxidant. The main oxidants used are sodium chlorate or manganese dioxide in amounts varying from 5 to 25 lb per ton of ore. Vanadium extraction, when it must be considered, causes complications in that an ambient acid leach which solubilizes the uranium seldom will remove over 35% of the vanadium. This necessitates a choice of three other methods of attack:

1. If the ore is low-lime it can be salt roasted at 835 deg C which solubilizes about 90% of the vanadium under good roasting conditions.
2. The ore can be hot acid leached with an excessive amount of acid. Generally, at least 200 lb of sulphuric acid per ton of ore above that necessary for uranium extraction will solubilize between 80% and 85% of the vanadium. High pulp densities are maintained, 45%-55% solids, and the pulp is held near the boiling point.
3. An acid cure can be used in which the ore is pugged with about 10% water and from 350 to 500 lb of sulphuric acid per ton. The ore is then allowed to cure in a pile for a time. Actually, the reaction is completed in several hours if a temperature of 100-150 deg C is maintained. The amount of acid necessary increases with the lime content of the ore. The acid cure will solubilize up to 95% of the vanadium.

*This paper is to be presented at the Symposium On Uranium Processing and Refining of the A.I.Ch.E. at Glenwood, Colo., September 12 through 15, 1954 and is published here through the courtesy of the A.I.Ch.E.



Carbonate Leaching

Sodium carbonate solution is universally employed to extract the uranium as the uranyl carbonate complex. Comparison of costs, solubility, and stability of sodium carbonate with other carbonates which might be used, leaves that chemical with no rival in the carbonate group.

For a long time many ores were considered refractory to sodium carbonate leaching, nor did this method give the uranium recoveries from amenable ores that were accomplished by acid leaching. Nevertheless, sodium carbonate leaching of uranium ores always has been preferred where it can be used because: it is more selective in uranium extraction; problems of corrosion and materials of construction are minimized; the lime in the ore (unless it is roasted) remains inert; and the subsequent recovery from the carbonate solution is easy to make.

Recent work instigated by the experiments of Dr. F. A. Forward, University of British Columbia, has indicated that the trouble has been in not establishing conditions for the oxidation of the mineralized uranium. Previously, the principle oxidation which occurred in sodium carbonate leaching was due to a small amount of aeration. Since the sodium carbonate leaching is done at near boiling temperatures, the solubility of the air in the pulp is inhibited. It has been found that sodium carbonate leaching under a partial pressure of several atmospheres of oxygen has given good uranium extractions on all the ores tried. The addition of permanganate as an oxidant to the sodium carbonate solutions also has assisted in uranium dissolution. One investigator has reported that not more than one or two pounds of permanganate per ton of ore are necessary, while others state that up to 25 lb of permanganate per ton is increasingly beneficial. The optimum amount necessary will vary, depending upon the amount of oxidizable constituents which each ore contains. (It is interesting to note that Dr. Forward's experiments found that in the absence of oxygen, no uranium was leached from pitchblende ores with a sodium carbonate solution.) These new developments are causing a renewed interest in carbonate leaching.

Extraction of Uranium from Solution

For good and sufficient reasons, the details of extracting uranium from solution are classified "Secret." Below is a list of methods of extraction which are being used on a commercial scale or which are in the experimental stages. General discussions of these methods can be found in the literature. Details of how they are applied to extraction of uranium from solution can be obtained by contractors of the AEC or by those who need the information and have qualified to build a plant, providing they have received FBI clearance.

Phosphate precipitation. (Used in South Africa, Sweden and in a mill currently being built by the French.)
Chemical purification.
Ion Exchange. (Used in South Africa.)
Solvent Extraction.
Cyanamid process (resin and pulp.)

Lime in the Ore

Regardless of whether an ore is more or less amenable to a carbonate leach, increasing lime content of the ore soon will overcome any advantage of an acid leach. Experimental work has shown that 18% lime is about the maximum that can be handled in agitation acid leaching or an acid cure, while 4% lime is approximately the limit for percolation acid leaching. The present salt roasting techniques do not make it practicable to roast a vanadiferous uranium-bearing ore containing over 6% lime.

An empirical rule of the Colorado Plateau, which is written into Domestic Uranium Program Circular 5 Revised, is not to exceed a weight ratio of three parts lime to one part V_2O_5 as the vanadium extraction then starts to decrease appreciably because of the formation of insoluble calcium vanadate compounds. Another thing to be kept in mind is that roasting an ore does decrease slightly the uranium ex-

Metallurgical Types of Uranium Ore

(Uranium extractions only considered in this table)

METALLURGICAL TYPE	PROBABLE FORMULA	RECOMMENDED EXTRACTION Acid Leach	RECOMMENDED EXTRACTION Carbonate Leach	REMARKS
1. Pegmatite (betafite, euxenite, samarskite, brannerite, davadite, etc.)		CX		Uranium bearing minerals of the rare earths and Co, Ta, Ti, Th, generally refractory.
2. Primary vein pitchblende, no visible sulphides	$xUO_2.yUO_3$	BX	BN	
3. Pitchblende with other metals, scattered sulphides		BX	BN	
4. Pitchblende with other metals, many sulphides		BX	BN	
5. Uranophane	$CaO.2UO_3.2SiO_2.6H_2O$	A		
6. Uraniferous fluorite	UO_2?	C		Requires destruction of fluorite mineral.
7. Autunite	$CaO.UO_3.P_2O_5.nH_2O$	A		n usually 8-12.
8. Schroeckingerite	$Ca_3Na.UO_3.CO_3.SO_4.F.10H_2O$	A		Difficult liquid-solid separation.
9. Roscoelite (vanadium mica)	$HgK(Mg,Fe)(Al,V)_4(SiO_2)_{12}$	A	AX	Vanadium ore containing 0.04%-0.08% U_3O_8 as carnotite.
10. Carbonaceous shale	Uranium hydrocarbons	RB		Generally 60-100 ppm U_3O_8.
11. Carnotite (or tyuyamunite) low vanadium, low lime	$K_2O.2UO_3.V_2O_5.nH_2O$	A	AX	n usually 1-3.
12. Carnotite (or tyuyamunite) low vanadium, intermediate lime	$(CaO.2UO_3.V_2O_5.nH_2O)$	A	AX	(n usually 9-10 but down to 4).
13. Carnotite (or tyuyamunite) low vanadium, high lime			AX	
14. Carnotite (or tyuyamunite) high vanadium, low lime		A	AX	
15. Carnotite (or tyuyamunite) high vanadium, intermediate lime		A	AX	
16. Asphaltic type, low vanadium, low lime	Thucholite and uranium hydrocarbons	RA	RAN	
17. Asphaltic type, low vanadium, intermediate lime		RA	RAN	
18. Asphaltic type, high vanadium, low lime		RA	RAN	
19. Asphaltic type, high vanadium, intermediate lime		RA	RAN	
20. Copper-uranium (tobernite) shale	$CuO.2UO_3.P_2O_5.nH_2O$	AX		n usually 8-12.
21. Copper-uranium (tobernite) sandstone		AX		
22. Uraninite, low vanadium, low lime	$xUO_2.yUO_3$	A	AN	
23. Uraninite, low vanadium, intermediate lime		A	AN	
24. Uraninite, low vanadium, high lime			AN	
25. Uraninite, high vanadium, low lime		A	AN	
26. Uraninite, high vanadium, intermediate lime		A	AN	
27. Uraniferous lignite	Uranium hydrocarbons	RB		Generally 50-100 ppm U_3O_8, but some deposits contain up to 0.10% U_3O_8.

LEGEND

Low vanadium ..... <0.75% V_2O_5
High vanadium ..... 0.75% V_2O_5 and greater
Low lime ..... <6.00% $CaCO_3$
Intermediate lime ..... 6.00%-18% $CaCO_3$
High lime ..... >18.00% $CaCO_3$

Note: Not all major uranium minerals included; only those which are predominant to date and which must be considered for present and future processing plants.

A—Uranium easily solubilized.
B—Requires moderate conditions for uranium dissolution.
C—Generally refractory. Requires vigorous treatment for uranium dissolution.
R—Ore requires roasting to remove carbon.
N—Oxidant required.
X—Oxidant beneficial.

Chemistry of Uranium Leaching

Uranium is taken into an acid solution as soluble uranyl and uranous salts . . .

$$UO_3 + 2H^+ + A^- \rightarrow UO_2A^+ + H_2O$$
$$UO_2 + 4H^+ + 2A^- \rightarrow UA_2^{++} + 2H_2O$$
$$UA_2^{++} + \tfrac{1}{2}O_2 + H_2O \rightleftharpoons UO_2A^+ + A^- + 2H^+$$

(Note: A^- denotes an anion)

. . or into a carbonate solution as the soluble uranyl carbonate complex . . .

$$UO_3 + 3CO_3^{--} + 2H_2O \rightarrow UO_2(CO_3)_3^{----} + 2OH^-$$

$$UO_2 + \tfrac{1}{2}O_2 + 3CO_3^{--} + H_2O \rightarrow UO_2(CO_3)_3^{----} + 2OH^-$$

The hydroxal ions formed in the carbonate reactions will in turn precipitate the solubilized uranium as sodium uranates . . .

$$UO_2(CO_3)_3^{----} + 4OH^- + 2Na^+ \rightleftharpoons Na_2UO_4\downarrow + 3CO_3^{--} + 2H_2O$$

$$2UO_2(CO_3)_3^{----} + 6OH^- + 2Na^+ \rightleftharpoons Na_2U_2O_7\downarrow + 6CO_3^{--} + 3H_2O$$

unless sufficient bicarbonate is in the solution to neutralize the hydroxal ion . . .

$$HCO_3^- + OH^- \rightarrow CO_3^{--} + H_2O.$$

For that reason it is necessary to have some bicarbonate always present in the carbonate solution to remove the hydroxal ions which are formed in the dissolution process as well as other hydroxal ions which might be formed in side reactions.

traction when compared with leaching an unroasted ore.

The carbonaceous content of a uranium ore is another factor which must be considered. In some ores much of the uranium is chemically combined with the carbon and neither an acid nor a sodium carbonate leach will break down this combination. Also the carbonaceous material fouls the carbonate solutions and this material must therefore be burned out of the ore by roasting or baking at 450-500 deg C, which leaves the uranium behind for solubilizing. The temperature range just cited is optimum since on either side the subsequent uranium extractions drop off. It has been found a good practice to reduce the carbon content of uranium ore to at least 0.2%.

Grinding

Fine grinding is not necessary when sandstone gangue ores are acid leached since the uranium is in the matrix which is broken down by the acid attack. Roasting an ore prior to acid or carbonate leaching results in porous calcine and this makes fine grinding unnecessary for good uranium extraction. In carbonate leaching of raw ore, dissolution rates tend to increase with fineness of grind and mineral liberation. This is also true of pegmatitic, volcanic, or quartzitic gangue uranium ores which are given an acid leach.

Actually, the main question of size reduction resolves itself into one of extraction vs slime handling problems and liquid-solid separations. Often in order to expose mineral grains down in the micron range, sliming all the ore is required; which certainly is not practical if one considers the small increase in percent of extraction that is achieved.

In the extraction of uranium from an ore or concentrate, there are three main items to be given consideration.

(a) Economic recovery of other valuable constituents.
(b) Interference of gangue minerals.
(c) Refractory nature of the uranium mineral.

Economic recovery of other valuable constituents in the ore. The only constituent which has influenced uranium metallurgy has been the recovery of vanadium. For purposes of economic and metallurgical classification, vanadiferous uranium-bearing ores are divided into two sub-groups:

(1) low vanadium—less than 0.75% V_2O_5.
(2) high vanadium—0.75% V_2O_5 and greater.

For classification purposes, 0.75% V_2O_5 is considered the economic "break-even" assay. This is based on the ore price of $0.31 per pound of contained V_2O_5 as given in Domestic Uranium Program Circular 5 Revised, attributable vanadium processing costs, percent recovery, and the Atomic Energy Commission's present floor price of $0.98475 per pound of contained V_2O_5 for the fused black oxide product which among other specifications must contain a minimum of 86.0% V_2O_5. Improved methods of vanadium concentration and metallurgy, as well as changes in the price structure for V_2O_5, can change this figure of 0.75% V_2O_5. This figure is not necessarily applicable for ores going to Colorado Plateau mills which are recovering vanadium at present, for each mill has its own outlook on the economics and costs involved.

Although copper has entered the picture occasionally, and there are some deposits of gold-silver ores and fluorspar ores which contain commercial amounts of uranium, it has not been necessary to consider any other metal value in the ore with the exception of vanadium. Happily, from a metallurgical standpoint, uranium now is important enough that the prime concern is to extract and recover the uranium. However vanadium recovery has and does influence the metallurgical treatment of uranium ores to a great extent as the vanadium content of certain uranium ores is high enough to preclude any wasteful treatment of that national resource. The same consideration should be given any other constitutent which may occur in a uranium-bearing ore and which can be recovered economically or stockpiled as a crude concentrate for later treatment.

Interference of gangue minerals. The gangue mineral which gives the most trouble is limestone or calcite ($CaCO_3$), particularly in sulphuric acid leaching, where it is a reagent consumer and the subsequent slow precipitation of the gypsum formed is one of the problems of every uranium mill man operating an acid circuit. In this dissertation the mineral composition $CaCO_3$, whether it is calcite or limestone is referred to as "lime."

For purposes of metallurgical and economic classification, uranium-bearing ores are placed in three lime subgroups:

1. low-lime—less than 6% $CaCO_3$.
2. intermediate-lime—6% to 18% $CaCO_3$.
3. high-lime—over 18% $CaCO_3$.

Dolomite ($CaCO_3 \cdot MgCO_3$), magnesite ($MgCO_3$), and basic constituents of the ore are all acid consumers as well as alumina and silica to a much lesser degree. Silica does not give trouble in carbonate solutions for there its dissolution is negligible below 120 deg C.

Sulphides are bothersome reagent consumers in the sodium carbonate leaching of raw uranium ores. The sulphide oxidizes and reacts with the carbonate forming sulphate and bicarbonate. Illustrating the reaction with pyrite . . .

$$2\,FeS + 7\tfrac{1}{2}\,O_2 + 8\,CO_3^{--} + 7\,H_1O \rightarrow 2\,Fe(OH)_3 + 4\,SO_4^{--} + 8\,HCO_3^- \quad (+8\,HCO_3^-)$$

Even though the sulphides do result in an increased consumption of carbonate and oxygen, this reaction does

add necessary bicarbonate to the solution which as previously mentioned must be present to remove any hydroxal ions which might be formed. Arsenides and other oxidizable constituents react in the same manner as the sulphides.

Lime ($CaCO_3$), dolomite ($CaCO_3 \cdot MgCO_3$), and magnesite ($MgCO_3$) in ores which are roasted prior to sodium carbonate leaching from calcium oxide (CaO) and magnesium oxide (MgO) which in turn react with carbonate and bicarbonate forming calcium and magnesium carbonate. Here again, there must be enough bicarbonate ion present to react with the hydroxal ion and prevent subsequent precipitation of the sodium uranates.

Calcium and magnesium minerals such as gypsum ($CaSO_4 \cdot 2H_2O$), anhydrite ($CaSO_4$), and epsomite ($MgSO_4 \cdot 7H_2O$), while inert in a sulphuric acid leach will consume carbonate forming calcium or magnesium carbonate . . .

$$CaSO_4 + CO_3^{--} \rightarrow CaCO_3 \downarrow + SO_4^{--}$$

Reagent Consumption

The following are good "approximations" for purposes of estimating reagent consumption of the major reagent consumers in the raw ore:

1. It takes one pound of sulphuric acid to neutralize a pound of lime, dolomite or magnesite in the raw ore.
2. One pound of $CaCO_3$ or 0.8 lb of $MgCO_3$ in the raw ore will consume one pound of sodium carbonate after the ore has been roasted. This assumes that none of the calcium or magnesium will be tied up as inactive compounds in the roasting process.
3. One pound of calcium sulphate will consume 0.8 lb of sodium carbonate.
4. Theoretically, reagent consumption due to sulphur in the sodium carbonate leaching of the raw ore is 6.6 lb of sodium carbonate per pound of sulphur. It seldom exceeds 4.5 lb of sodium carbonate per pound of sulphur, and is generally less than this, depending upon the leaching condition and severity of the leach treatment.

Refractory nature of the uranium mineral. All experimental work and established practices point to the fact that to be most effectively solubilized in an acid or a carbonate leach, the uranium must be in its hexavalent state of oxidation. The problem then, is how to most effectively oxidize the uranium minerals in which the uranium is not hexavalent. This is a phenomenon of surface reaction at the mineral face and concerns itself with oxidants and mineral exposure. Leaching contact time and fineness of the ore grind are pertinent considerations of this when treating certain types of uranium ores.

Uranium mineralization falls into two classifications: (1) primary mineralization where the uranium minerals have precipitated or crystallized from hot solutions or fluid magma and have retained their original form; and, (2) secondary mineralization where this form has been altered by oxidation and ground waters, or the uranium has been leached from the primary mineralization and redeposited. Secondary uranium mineralizations generally are oxidized, although the tonnages of reduced secondary uranium mineralizations are now quite important, and are increasing daily. Secondary uranium mineralizations need not be considered refractory as long as a suitable oxidant is available.

In the primary uranium mineralizations, the pitchblende ores are also amenable to both acid and carbonate leaching under more rigorous conditions and longer contact time. However in primary uranium mineralizations, where the uranium is chemically tied up with the rare earths, oxides of titanium and thorium, and other refractory oxides, uranium dissolution becomes a very difficult task since the refractory mineral itself must be destroyed. Carbonate leaching will not do this.

Metallurgical Classification

The Grand Junction Operations Office has tentatively classified uranium ores into thirteen groups, based primarily on the predominating mineralization in the ore. These groups have been subdivided into 27 different categories or types into which a uranium-bearing ore can be placed for processing consideration. (See Table I.) It should be emphasized that the basis for these 27 categories is determined by uranium extraction problems, and not by the subsequent uranium recovery from solution.

Some general remarks can be made concerning the leaching characteristics of the various types of ores. Pegmatite ore, type 1, is the most difficult in which to dissolve the uranium values. These are refractory primary minerals and require strong acid concentrations, high temperatures, and fine grinding if the mineral is well disseminated in the gangue. Pitchblende ores, types 2, 3, and 4, are primary uranium mineralizations and require oxidants under moderate conditions to effect uranium dissolution.

In uraniferous fluorite ores, type 6, another primary mineralization, the fluorite minerals must be completely broken down to extract the uranium from the uraniferous fluorite such as would be done in its reaction with sulphuric acid to produce hydrofluoric acid. The uranium can then be water leached from the $CaSO_4$ residue under controlled conditions.

The schroeckingerite mineral is the result of concentration by ground water and is soluble in dilute acids; however, the caliche and bentonitic character of the schroeckingerite ores has so far frustrated attempts at the liquid-solid separations necessary. The carbonaceous shales are too low in grade to be considered for uranium recovery at the present time, but constitute a very large uranium reserve. For that reason a considerable amount of research work is being done on various attacks to obtain good recoveries by acid leaching.

The asphaltic type ore will contain up to five or six percent carbon, while the uraniferous lignites generally average about 40%-50% ash. After burning off the carbon in these ores, the uranium can be extracted under normal leaching conditions using an oxidant. The ash from some uraniferous lignites is quite refractory while the ash from others is amenable to normal leaching conditions.

Uraninite ores should be leached with an oxidant, and as a general rule so should all uraniferous ores, even those classified as containing oxidized uranium minerals, as there seems to be some reduced uranium minerals occurring in any secondary uranium ore. Although it is not always indicated in Table I, actually an oxidant in an acid leach is beneficial and should always be a considered additive. However unlike its behavior in carbonate solution, the uranous ion is soluble in acid solutions, although more subject to precipitation than the uranyl ion, and the use of an oxidant in acid leaching seldom increases the uranium extraction more than a few percent in the "ninety plus" percent range, so it is not considered essential by most uranium mill operators.

Leaching Circuits

Table II presents in a very general and simplified way the leaching circuits used for uranium dissolution in the uranium concentration mills now in operation or being constructed on the Colorado Plateau. Each mill may deviate somewhat from one of the sim-

plified circuits, but basically the circuits shown or some combination of them are used. The strength of the carbonate solutions used in the mills' leaching circuits varies from 2.5% to 10.0% Na_2CO_3 with from 1.0% to 2.5% sodium bicarbonate. The acidity maintained in the acid leaching circuits should be below a pH of 1.5 and several percent excess acid is usually maintained in the leaching liquors.

The circuit used by each mill is not equally effective in treating the different types of ore and each mill attempts to obtain those types of ore which are best suited to its particular processing conditions. The tails from the various circuits should assay from 0.005% U_3O_8 for a good acid leach on a clean sandstone ore to 0.03% U_3O_8 for ores which have small amounts of uranium minerals refractory to that particular circuit, or in which the roasting procedure may cause lower uranium solubility. Because of operational difficulties or treatment of a refractory ore, final tailings of 0.05%-0.06% U_3O_8 occur occasionally. In attempting to determine why this last "squeal," or several hundredths percent of uranium still remains in the ore, the Raw Materials Development Laboratory of the Atomic Energy Commission at Winchester, Mass., has been making a continuous study of tailing samples submitted periodically to it by the operating mills and the findings support the following general conclusions:

1. The minus 200 mesh material assays approximately twice as much in U_3O_8 as the grade of the whole residue.
2. The plus 35 mesh material is higher in grade than the whole residue and in the majority of cases it is higher grade than the minus 200 mesh material. This fraction generally contains uranium-bearing hydrocarbon and cemented sand grains.
3. The residual uranium occurs as water soluble material, uranium-bearing hydrocarbon, and unreacted carnotite and/or tyuyamunite.

A great amount of effort has been put forth on the flotation of uranium minerals, but because several uranium minerals may occur in the same ore and the low tailing desired, satisfactory results have not been achieved. It has been found possible to float a carbonaceous uranium containing concentrate from asphaltic type uranium ores, which then can be treated separately for uranium recovery. The flotation tailings contain the uranium not tied up with the carbonaceous material and must also be leached. Recent flotation work on uranium ores has been directed toward lime removal in order to cut down the high acid consumption inherent in the acid leaching of ores containing more than several percent lime. There are indications that a lime concentrate assaying over 50% $CaCO_3$ (generally 60%-75% $CaCO_3$) containing about 15% of the uranium in the heads can be produced, leaving a tailing assaying 1% to 3% lime and containing approximately 85% of the original uranium value. This tailing can then easily be acid leached and the concentrate can be leached in a carbonate circuit when convenient.

The preceding commentary on methods of uranium extraction has been very general and broad in an attempt to cover an extensive subject. There are exceptions to all the remarks made and the best advice on determining the leaching amenability of any ore is to give it a bench scale test.

Uranium Geophysics

(*Continued from p 97*)

whereby gamma logs are correlated with the core on *every* core hole until in each drilling area it is determined what percentage of core hole is necessary to establish the geology and ore reserves with the combination of cores and gamma **log.**

With careful work it should be possible to: (1) extend formations between holes up to 100 ft apart by gamma log correlation; (2) calculate thickness and general type of formation from the gamma log, and determine direction of thickening and thinning of beds; (3) evaluate the approximate grade of ore after correlating the gamma logs with core assays from several holes.

A special technique can be utilized to determine the trend of ore in favorable drilling areas. The maximum gamma log defection recorded in an ore-bearing sandstone can be plotted for each drill hole and a map drawn showing lines of equal radioactive intensity. This technique is used routinely on the Colorado Plateau.

Limitations: It is not possible to get lithologic information from ore zones because of the masking effect of high radiation from the ore. Electric logs supply this information but are now on an experimental basis.

Holes must be drilled BX or larger to accommodate satisfactory logging equipment (the detector may be 2 in. in diameter).

Most scintillation logging instruments show serious limitation of response in ore zones assaying more than 1%.

There is no simple relationship between the "kick" in the gamma log and the grade of the ore because for any given grade of ore, total radiation is proportional to thickness, up to 3 ft.

Radioactive gas (radon) may give unreliable readings. This is not usually serious in Plateau operations but if the gamma ray log and core assays do not check out it should be considered as a possible cause.

Cost and Availability: It is possible to have elaborate scintillation logging equipment built to order at a cost of approximately $20,000.

Smaller portable scintillation logging equipment has been developed by AEC and the USGS, and will be built by commercial suppliers. The equipment will probably be available commercially in six or eight months at a cost of between $5,000 and $10,000.

Operating cost will include salaries of two people—one geologist and one field truck continuous operation. The number of units required can be estimated by assuming a logging time of a half hour for each 100-ft hole from set up to take down of equipment.

Carborne Surveying

Carborne reconnaissance is completely analogous to airborne reconnaissance except that the detector is carried closer to the ground and smaller areas are scanned at lower speeds. Detection equipment should be mounted as high above the ground as possible.

Other Geophysical Methods

Seismic refraction has been used successfully by the AEC and the U. S. Geological Survey to outline ore-bearing channels in the Moenkopi but it is not definitely established that this technique results in real savings over subsurface geologic methods except in very special cases.

Electric logging has been used successfully on a research basis to supply information from drill holes and it is probable that some type of electric logging technique will come into general use within the next year. The information from electric logs is extremely valuable when used in conjunction with gamma. Equipment is now being built which will allow gamma logs and electric logs to be taken in the same operation. At the present time electric logging cannot be done effectively in dry holes.

Schedule of Prices for Uranium Ore

(As specified in Circ. 5 revised, and Circ. 6)

Grade of ore, percent U_3O_8	Pounds of U_3O_8 per ton of ore	Base price		Grade Premium		Mine develop. allowance .50 per lb	Prices per Ton of Ore		
		Pound U_3O_8	Ton of ore	75c a lb over 4-lb	25c a lb over 10-lb		Price before initial prod. bonus & haulage allowance	Initial prod. bonus on 10,000 lb	Price before haulage allowance
0.10	2.00	$1.50	$ 3.00	$ —	$ —	$ 1.00	$ 4.00	$ 3.00	$ 7.00
0.11	2.20	1.70	3.74	—	—	1.10	4.84	3.74	8.58
0.12	2.40	1.90	4.56	—	—	1.20	5.76	4.56	10.32
0.13	2.60	2.10	5.46	—	—	1.30	6.76	5.46	12.22
0.14	2.80	2.30	6.44	—	—	1.40	7.84	6.44	14.28
0.15	3.00	2.50	7.50	—	—	1.50	9.00	7.50	16.50
0.16	3.20	2.70	8.64	—	—	1.60	10.24	8.64	18.88
0.17	3.40	2.90	9.86	—	—	1.70	11.56	9.86	21.42
0.18	3.60	3.10	11.16	—	—	1.80	12.96	11.16	24.12
0.19	3.80	3.30	12.54	—	—	1.90	14.44	12.54	26.98
0.20	4.00	3.50	14.00	—	—	2.00	16.00	14.00	30.00
0.21	4.20	3.50	14.70	0.15	—	2.10	16.95	14.70	31.65
0.22	4.40	3.50	15.40	0.30	—	2.20	17.90	15.40	33.30
0.23	4.60	3.50	16.10	0.45	—	2.30	18.85	16.10	34.95
0.24	4.80	3.50	16.80	0.60	—	2.40	19.80	16.80	36.60
0.25	5.00	3.50	17.50	0.75	—	2.50	20.75	17.50	38.25
0.26	5.20	3.50	18.20	0.90	—	2.60	21.70	18.20	39.90
0.27	5.40	3.50	18.90	1.05	—	2.70	22.65	18.50	41.55
0.28	5.60	3.50	19.60	1.20	—	2.80	23.60	19.60	43.20
0.29	5.80	3.50	20.30	1.35	—	2.90	24.55	20.30	44.85
0.30	6.00	3.50	21.00	1.50	—	3.00	25.50	21.00	46.50
0.31	6.20	3.50	21.70	1.65	—	3.10	26.45	21.70	48.15
0.32	6.40	3.50	22.40	1.80	—	3.20	27.40	22.40	49.80
0.33	6.60	3.50	23.10	1.95	—	3.30	28.35	23.10	51.45
0.34	6.80	3.50	23.80	2.10	—	3.40	29.30	23.80	53.10
0.35	7.00	3.50	24.50	2.25	—	3.50	30.25	24.50	54.75
0.36	7.20	3.50	25.20	2.40	—	3.60	31.20	25.20	56.40
0.37	7.40	3.50	25.90	2.55	—	3.70	32.15	25.90	58.05
0.38	7.60	3.50	26.60	2.70	—	3.80	33.10	26.60	59.70
0.39	7.80	3.50	27.30	2.85	—	3.90	34.05	27.30	61.35
0.40	8.00	3.50	28.00	3.00	—	4.00	35.00	28.00	63.00
0.41	8.20	3.50	28.70	3.15	—	4.10	35.95	28.70	64.65
0.42	8.40	3.50	29.40	3.30	—	4.20	36.90	29.40	66.30
0.43	8.60	3.50	30.10	3.45	—	4.30	37.85	30.10	67.95
0.44	8.80	3.50	30.80	3.60	—	4.40	38.80	30.80	69.60
0.45	9.00	3.50	31.50	3.75	—	4.50	39.75	31.50	71.25
0.46	9.20	3.50	32.20	3.90	—	4.60	40.70	32.20	72.90
0.47	9.40	3.50	32.90	4.05	—	4.70	41.65	32.90	74.55
0.48	9.60	3.50	33.60	4.20	—	4.80	42.60	33.60	76.20
0.49	9.80	3.50	34.30	4.35	—	4.90	43.55	34.30	77.85
0.50	10.00	3.50	35.00	4.50	—	5.00	44.50	35.00	79.50
0.60	12.00	3.50	42.00	6.00	0.50	6.00	54.50	42.00	96.50
0.70	14.00	3.50	49.00	7.50	1.00	7.00	64.50	49.00	113.50
0.80	16.00	3.50	56.00	9.00	1.50	8.00	74.50	56.00	130.50
0.90	18.00	3.50	63.00	10.50	2.00	9.00	84.50	63.00	147.50
1.00	20.00	3.50	70.00	12.00	2.50	10.00	94.50	70.00	164.50
2.00	40.00	3.50	140.00	27.00	7.50	20.00	194.50	140.00	334.50
3.00	60.00	3.50	210.00	42.00	12.50	30.00	294.50	210.00	504.50
4.00	80.00	3.50	280.00	57.00	17.50	40.00	394.50	280.00	674.50
5.00	100.00	3.50	350.00	72.00	22.50	50.00	494.50	350.00	844.50
6.00	120.00	3.50	420.00	87.00	27.50	60.00	594.50	420.00	1,014.50
7.00	140.00	3.50	490.00	102.00	32.50	70.00	694.50	490.00	1,184.50
8.00	160.00	3.50	560.00	117.00	37.50	80.00	794.50	560.00	1,354.50
9.00	180.00	3.50	630.00	132.00	42.50	90.00	894.50	630.00	1,524.50
10.00	200.00	3.50	700.00	147.00	47.50	100.00	994.50	700.00	1,694.50

For More Profit—Keep the Grade Up

INTELLIGENT MINING AND SHIPPING of ore can often make the difference between a profit and a loss for marginal production. But in order to appraise this aspect, it is best to review the prices and incentives that the AEC has offered to stimulate Plateau production. Incentive payments for acceptable ores from domestic mines are[1]: (1) a guaranteed base price of $3.50 per lb of ore assaying 0.20% U_3O_8 and more; (2) premiums based on grades above 0.20% (see price table on opposite page); (3) a development allowance of 50c per lb of U_3O_8 contained in ores assaying over 0.10% U_3O_8; (4) an ore haulage allowance of 6c a ton mile for maximum of 100 mi; and (5) an initial production bonus which may amount to as much as $35,000 in addition to all other payments. Items (1) to (4) inclusive are effective through March 31, 1962 under Circular 5 Revised; and item (5) is effective until Feb. 28, 1957 under Circular 6.

The table on the opposite page shows how to compute the value of ores as specified in Circular 5 Revised, and Circular 6. Haulage allowance, vanadium payments, and lime penalties will be variable and hence are not included.

The following example shows how items (1), (2), (3) and (5) are applied on an ore with assay value at 0.55% U_3O_8:

(1) Base price $3.50 x 11 lb	$38.50
(2) Premium above 4 lb at 75c (7x. 75)	5.25
(2) Premium above 10 lb at 25c (1x.25)	.25
(3) Develp. allow. at 50c (11x.50)	5.50
Base price	$49.50
(5) Production bonus (after certification)	38.50
Total	$88.00

Other examples are given below showing how ore settlement calculations are made in greater detail, including the payment for vanadium and the haulage allowance.

How to Get More for Your Ore

Careful study of the AEC price circulars clearly indicates that it is highly desirable to keep the grade as high as possible. This can be achieved by selective mining; clean mining and the use of muck sheets in hand operations; careful handling of fines (because here is where the values often concentrate —the sand grains are barren); hand sorting with the aid of geiger counters; or geigering each carload of ore before shipping if it is hard to determine grade visually or otherwise. Even though these precautions sound elementary, they are often disregarded on the Plateau today.

Conversations with a few veteran uranium leasers and shippers reveal such additional helpful hints to producers as the following:

Chipping the Ore. One leaser made a handsome profit by re-mining portions of an old property with a jackhammer fitted with a chisel-type tool. He couldn't risk blasting the high-grade all over the drift, so he gouged it out into powder boxes. While this technique wouldn't have widespread application, it does emphasize the need for going after pounds of high-grade rather than tons of ore.

Upgrading Ore. A wet attrition mill is being installed at VCA's Monument No. 2 to upgrade marginal ore. See p 101. But the system need not always be as elaborate as this. Simple screening with hand-sorting extended the life of one of U. S. Vanadium Co.'s properties in the Long Park area by one year.

Dump Recovery. Owen Malin, of Moab, told *E&MJ* reporters how he made a profitable recovery from an old mine dump that he leased. First he skimmed the surface of the dump with a light scraper. Then he scanned the surface with a geiger counter to tell where the values lay. By selective mining with the scraper he was able to remove those portions which could be upgraded with a vibratory screen. When he ran into mudstone which tended to pass through the screen and dilute the concentrate, he speeded up the unit and changed the size of the screen. This caused the shaley mudstone to slide off the screen and permit high-grade fines to pass through.

Blending. There may be some gain in blending low-grade ores with higher grades to bring the average shipping grade above 0.2% U_3O_8. But calculations indicate that it does not pay to blend ores running higher than 0.2% (See *E&MJ*, January 1952, p 81.)

High-Grade Mill Premium. Uranium Ore Producers Association[2] points out that one mill will pay a greater haulage allowance for high-grade ore without regard to the number of miles involved in the haul. In general, high-grade ores can be milled more profitably than low-grade ores. (See p 103).

[1] "Hints for the Prospector" by Phillip W. Simmons, mining engineer, Mining Div., Grand Junction Operation, AEC. *Mining Engineering*, April 1954.

[2] UOPA "Information Digest" May 1954

Example of Purchase Settlement for Uranium Ore by

I. For 0.16% Ore

		Settlement assay	%	lb
Weight of shipment, wet	32,330 lb	U_3O_8	0.16	49.58
H_2O content	4.15%	V_2O_5	1.18	365.66
Dry weight of shipment	30,988 lb	$CaCO_3$	1.9*	588.77

	Per lb	Per ton	Short tons	Total value
U_3O_8 0.16% =3.2 lb	$ 2.70	$ 8.64	15.494	$133.87
Develop. allowance 3.2 lb	.50	1.60	15.494	24.79
Total U_3O_8 payment	.....	$10.24	15.494	$158.66
Haulage allowance 60 miles at 6c per wet ton mile	.....	.....	16.165	58.19
Total				$216.85
V_2O_5 1.18% =23.6 lb at	.31	7.316	15.494	113.35
Total gross price				$330.20

II. For 0.2% Ore

		Settlement assay	%	lb
Weight of shipment, wet	33,850 lb	U_3O_8	0.20	65.38
H_2O content	3.43%	V_2O_5	0.19	62.11
Dry weight of shipment	32,690 lb	$CaCO_3$	0.5*	163.45

	Per lb	Per ton	Short tons	Total value
U_3O_8 0.20% =4 lb at	$3.50	$14.00	16.345	$228.83
Develop. allowance 4 lb at	.50	2.00	16.345	32.69
Total U_3O_8 payment	.....	$16.00	16.345	$261.52
Haulage allowance 58 miles 6c per wet ton mile	.....	.....	16.9250	$58.90
Total				$320.42
V_2O_5 0.19% =3.8 lb at	.31	$1.178	16.345	19.25
Total gross price				$339.67

* No lime penalty for this ore.

HOW TO STAKE A CLAIM. Charles Steen points out a good 4x4-in. stake 4 ft high, solidly set and properly marked.

HOW NOT TO STAKE A CLAIM. Somebody should have told the prospector who set this stake about witness corners.

Plateau Claim Stakers Must Heed Both Custom and Written Law

OVERSTAKING AND CLAIM-JUMPING in certain boom areas has raised this question among venture groups studying Plateau possibilities—"How do you know that claims are valid, and how do you protect them against jumping?"

The first obvious answer is to obey the state and federal mining laws. AEC-USGS published a useful pocket handbook "Prospecting for Uranium"[1] which serves as a practical and useful guide. AEC also prepared a mimeographed pamphlet "Location of Mining Claims in the States of Arizona, Colorado, New Mexico, and Utah."[2] An excellent prospector's book, "Minerals for Atomic Energy"[3] is about to come off the presses which covers Federal mining laws and abstracts mining laws for the 12 Western States.

These references will not make you a legal authority, but they will prevent you from making serious errors in staking ground. Note for instance how the prospector put a stake right in the middle of a public highway (above).

Floyd Odlum, who has a thorough background in mining law, made an interesting observation when *E&MJ* editors queried him recently about the apparent confusion of mining laws. — He replied "The laws are clear enough, but custom confuses the situation." This statement implies another bit of advice—acquaint yourself with the prevailing customs.

By way of illustration, it might be cited that virtually all of the Plateau uranium claims are staked as lodes. But because of the flat (or nearly flat), nature of the orebodies it has been the custom of claim holders *not* to seek extralateral rights. This sensible tacit agreement is widely observed to prevent chaos—and illustrates how custom can establish order.

Here are some additional practical suggestions and topics that come up repeatedly in talks with Plateau operators and engineers:

Staking Claims. Whether State laws are explicit or not, it pays to mark all corners and the ends of centerlines with posts or stout monuments. If corners are inaccessible, use witness corners. This will deter unintentional claim jumping.

Location Notices. Vague wording such as "West of a certain mountain gap", or "17 miles east of so and so" has actually appeared on location notices, and the owners are bound to have a hard time to prove ownership if it is ever contested. If a claim is worth staking, it is worth tying to some readily identifiable survey corner or landmark. Current security laws in Colorado require that property be surveyed by a registered surveyor or mining engineer if the property is to be financed by public security offerings.

Bulldozer Boom

There wasn't a soul in sight when the bulldozer crew cut the throttle on the engine at quittin' time Saturday night, and knocked off for the weekend. They let the machine stand right where it was because there would be no traffic on this road until they finished. — It was a drill access road heading up into some good-looking uranium country.

But Monday morning when the boys came back on shift, the roadside was studded with stakes covering over 200 claims. It seems that some smart prospectors figured that this was the end of the road and that they might just as well cover some of the area with claims in case any of the drills hit pay dirt. There may have been some red faces when the dozer pushed its way on up the hill for miles and miles, and if anybody wants to buy a uranium claim cheap, it could be arranged.

Moral: When you're looking for uranium on foot, be sure and muffle that geiger click; and if you're flying a scintillometer, don't circle back for a second look when your needle goes off scale. By the time you land you may be heading for staked country.

[1] Prospecting for Uranium, Published by the AEC and USGS. For sale by Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price 45c.

[2] Available at the Grand Junction Operations Office of the Atomic Energy Commission, Grand Junction, Colo.

[3] Minerals for Atomic Energy, by R. D. Nininger, Deputy Director for Exploration, AEC. Published by D. Van Nostrand, New York, N.Y. (publication date Oct. 30 1954. See Books p 138).

Work Your Claim. In general, the public at large and the law are on the side of the man who stakes a claim with the serious intention of finding and producing ore; and the best way to demonstrate this intent is to work your claim by building roads, drilling, shaft sinking, driving adits, etc. Current requirement by federal law that claim owners do assessment work each year was responsible for a lot of feverish claim working prior to midnight, July 1, 1954.

Land Men. Companies carrying out broad exploration programs find that it pays to have an experienced "land man" on the staff who knows potential uranium country, can stake claims properly, knows how to negotiate leases on Indian lands, and has a practical knowledge of mining laws.

Indian Reservations. Leases on Indian reservations are generally acquired through negotiations with the Bureau of Indian Affairs officials responsible for the various reservations. Such leases confer a firm right to explore, or to mine without danger of cloud on the title that may occur when claims are staked on open Public Domain.

Government Leases. Leases on lands withdrawn by the AEC for exploration are much sought after because the royalties are moderate and designed to promote production. Parties receiving such leases must be financially responsible and have demonstrated ability to extract ore as completely and efficiently as possible. Actually only a small percentage of the Public Domain on the Plateau has been withdrawn—less than ½%—and many withdrawn areas have been restored to Public Domain.

Aspinall-Dawson Bill. This highly-constructive bill which became a law on Aug. 13, 1954, amends mining laws, mineral leasing laws, and the Atomic Energy Act. It is expected to facilitate uranium production because it permits location of mining claims on Leasing Act lands, validates certain mining claims, permits recovery of leasable minerals from lands covered by mining claims, and deletes reservation to the U. S. Government of fissionable source materials from the Atomic Energy Act, thus clearing the cloud on the title of many existing claims.

School Sections. Leases on State school sections convey a firm right to explore, prospect, and/or mine uranium orebodies. Royalties are generally reasonable, 12½% and up. In Utah, Sections 2, 16, 32, and 36 are usually reserved for school sections in surveyed townships.

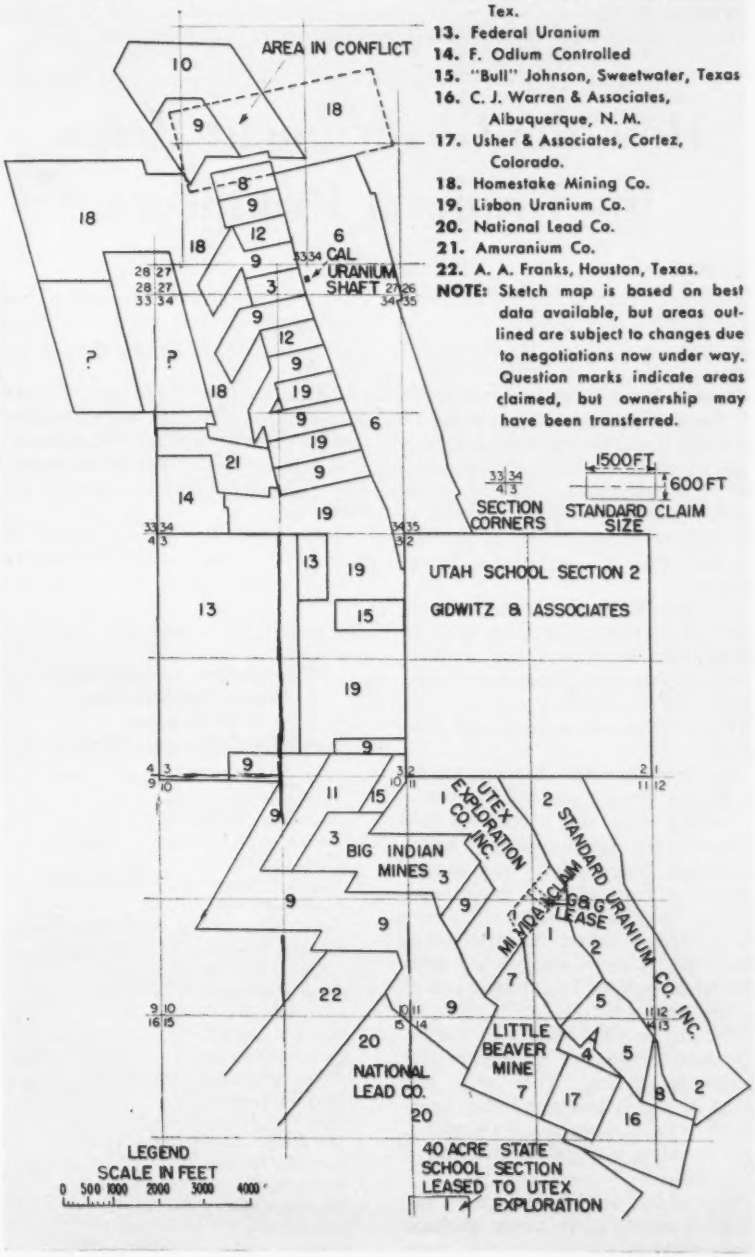
Some of the problems involved in establishing claim ownership in boom mining areas are illustrated in the accompanying sketch map of the area adjacent to the Utex Exploration holdings in the Big Indian Wash area. This map should not be regarded as official because of claim conflicts, etc.

Sketch of Claim Map in Vicinity of Utex Uranium Holdings in Big Indian Wash Area of Utah

KEY TO NUMBERS ON MAP

1. Utex Exploration Co., Inc.
2. Standard Uranium Co., Inc.
3. Big Indian Mines, Inc.
4. Steen and Barrett (50% Each)
5. U. S. Uranium and Oil Co.
6. Cal Uranium
7. Little Beaver (Homestake Mining Co.)
8. T. Harrington & Associates, Albuquerque, N. M.
9. R. M. Barrett & Associates
10. E. L. Cord, Nevada
11. Uranium Reduction Co. (Utex & E. Snyder of Combined Metals)
12. Woodson Producing Co., Dallas, Tex.
13. Federal Uranium
14. F. Odlum Controlled
15. "Bull" Johnson, Sweetwater, Texas
16. C. J. Warren & Associates, Albuquerque, N. M.
17. Usher & Associates, Cortez, Colorado.
18. Homestake Mining Co.
19. Lisbon Uranium Co.
20. National Lead Co.
21. Amuranium Co.
22. A. A. Franks, Houston, Texas.

NOTE: Sketch map is based on best data available, but areas outlined are subject to changes due to negotiations now under way. Question marks indicate areas claimed, but ownership may have been transferred.



DIVISION HEADS of the Grand Junction Operations Office of the AEC are (l to r) Ernie Gordon, exploration; Charlie Tonry, processing; E. A. Youngberg, mining.

How the Government Helps the Uranium Producers

THERE ARE TWO PRINCIPLES which are keys to the Government's activities in the uranium industry: (1) supplies of uranium ore can best be developed by private industry working for a profit; (2) the American taxpayers must get as much uranium for their money as possible while the miner and prospector get a fair return for their investment. The raw materials division of the AEC is responsible for implementing this phase of the Atomic Energy Program.

On the Colorado Plateau, greatest domestic source of uranium ore, the Grand Junction (Colo.) operations office administers the Commission's program. Three divisions comprise the GJOO; exploration, mining, and processing.

To the exploration division, headed by Ernest Gordon, falls the problem of finding more ore. About 15 field parties are engaged in geological reconnaissance. Where they find ground worthy of subsurface exploration, drilling recommendations are drawn up. At present, these are centered in areas that represent what would probably be considered by private industry as "unreasonable risks."

The engineering branch of the exploration division is the contracting agency for drilling. They write and award contracts and supply accessory functions like supply, communications, transportation, housing and auditing of drill records.

Most of the drilling footage is "devoted to exploration along geologic trends, seeking new ore deposits, with only a minor amount devoted to delimiting of individual orebodies." Don't expect the AEC to block out your ore for you.

Recent contracts have had 12 to 15 competing bidders and as of last December there were about 100 diamond drill rigs, 30 rotary and 8 percussion rigs available for contract work on the Plateau.

The GJOO exploration branch is part of the raw materials division's overall exploration program, charged with finding uranium all over the U.S.

The mining division under E. A. Youngberg, concerns itself with:

(1) Contracts for the purchase of ores at the 13 ore buying stations.

(2) Examination of mining properties on which application has been made for certification to receive bonus payments on initial and certain other production under Circular 6.

(3) Recommending access roads.

(4) Granting mineral leases on orebodies developed by the exploration division. There are 40 leases now in operation, with 250 applicants for others.

(5) Checking on the use of the development allowance (50c per lb of U_3O_8) granted by the Commission.

(6) Administration of ore prices, bonus payments, haulage allowances, sampling and assaying of incoming ore, ventilation, ore samples, and mine operation and equipment.

The processing division, under Charles Tonry, concerns itself with contracting with privately owned and operated mills for the concentration of uranium ores delivered to the buying stations.

Other Government agencies have made substantial contributions.

U.S. Geological Survey has done about half of the Government sponsored drilling, administering and evaluating its own program. In addition, it has undertaken long range geologic studies to throw some light on the occurrence of uranium ore and possible guides to discovery in the future.

Defense Minerals Exploration Administration is established to provide Government aid in finding new sources of strategic metals and minerals including uranium. Government participation in approved projects is 75% of the total cost of the project. (Formerly it was 90%.)

Total value of uranium exploration contracts executed through July 31, 1954, was $1,593,163; Government participation totaled $1,428,722. Of the 212 applications for uranium exploration contracts received through July 31, 1954, 32 were in process, 60 had been executed, 81 were denied, and 39 withdrawn.

DMEA has published a pamphlet telling how to apply for contracts and how they are executed. Since "uranium exploration" can vary from wildcatting on one property to development drilling on another, DMEA officials and the USGS and USBM must use careful judgment when weighing applications to make sure that expenditures go for prudent exploration. Since both the taxpayer and the applicant stand to lose if DMEA is not wisely administered, it is understandable that examination of applications must be thorough.

Companies Conducting Major Exploration Programs on the Colorado Plateau

U. S. Vanadium Co.
Climax Uranium Co.
Anaconda Copper Mining Co.
Vanadium Corporation of America
Vitro Uranium Co.
Haystack Mountain Development Co.
Homestake Mining Co.
Eagle Picher Mining & Smelting Co.
Navajo Uranium Div. (Kerr-McGee Oil Industries, Inc.)
Simplot Mining Co.
Hunt Oil Co.
National Lead Co.
Hecla Mining Co.
Patino Mines & Enterprises Co.
Utex Exploration Co.
New Park Mining Co.
The Golden Cycle Corp.
La Salle Mining Co.
Standard Uranium Corp.
Newmont Mining Corp.

Typical Costs on the Plateau

EXPLORATION PROGRAM*

Annual operating budget	Maximum	Minimum
Management and technical services	$ 75,000	$ 30,000
Aircraft operation (3 mxa., 1 min.)	150,000	60,000
Field staff, salary and expenses	200,000	75,000
Drilling and/or excavation	450,000	150,000
Property, consultants, misc.	125,000	30,000
	$1,000,000	$345,000
Capital investment	$ 220,000	$ 60,000

PROSPECTING

This figure runs the gamut from the old timer who can stay out in the hills on next to nothing to the dude with the deluxe trailer. It's a respectable compromise that to do a good job without real hardship takes an outlay of about $3,000 for vehicle and equipment and about $2.500 a year for maintenance of man and machines.

EXPLORATION DRILLING

General averages cited (in dollars per ft)

Diamond drill	$4.00
Rotary drill (to 300 ft)	1.00
Rotary drill (to 1000 ft)	4.00
Diamond bit cost per ft	0.25 to 0.30
Percussion drill with air (to 350 ft)	0.75 to 1.00

Representative Drill Contractors' Prices (In dollars per foot)

Depth in feet→	0-100	100-200	200-300	300-500	500
Diamond drill (core)	$2.00	$2.25	$2.75	$3.75	$5.50 4.50
Diamond drill (non core)	1.75	1.75	2.00	2.50	3.00
Wagon drill	0.75	1.00	1.40	(max depth 300 ft)	
Rotary drill (wet)	1.50	1.50	1.75	2.25	
Rotary drill (dry)	1.00	1.25	1.25	1.75	2.25 3.50

AIRBORNE EXPLORATION

Monthly operating expense, per plane crew plus maintenance (70 hr flight time)	$3,000
Capital investment	$6,000 to 12,000

DRILL HOLE LOGGING

Monthly operating expense per unit Salary and expenses	$900
Capital investment	$5,000 to 10,000

MINING

Vertical shaft	$150 per ft
Incline shaft (9x9 ft)	$50 to $60 per ft
Heading	$30 per ft
Calyx drill hole for 36-in. shaft	$35 to $40 per ft
Capital investment for small mine	$25,000

HAULAGE

Access road, per mi	$900 to $1300
Ore haulage costs per ton-mile	.06 to .08

MILLING

Capital investment per ton of capacity per day**	$10,000 to $15,000

* Estimates of maximum and minimum programs courtesy of Munroe Pofcher, New York, N. Y.
** Estimated.

E. H. CRABTREE, Deputy Manager, Grand Junction Operations, Atomic Energy Commission.

UOPA OFFICERS are Kim Theobald, secretary-treasurer; Stephen L. R. McNichols, counsel; Norman Ebbley, vice president; Tom Skidmore (standing) president; John Schumacher, vice president.

VERNON PICK, discoverer of the famous Delta mine recently purchased by Atlas Corp.

Uranium Ore Producers Association

WHEN ANY SEGMENT of the mining industry grows as fast as Plateau uranium mining did in the past six years it is bound to have growing pains. But fortunately a sizeable group of producers decided not to struggle alone, and therefore organized the present Uranium Ore Producers Association which exerts a combined attack on the problems that confront the local industry.

UOPA puts out an Information Digest, publishing news and taking up issues on taxes, Public Land laws, uranium prices, leasing policies, etc. of specific interest to Plateau operators.

UOPA has served constructively as a vent for a certain amount of bottled up discontent. Where actual distress was evident, the AEC responded sympathetically by revising original price circulars to provide such incentives as initial production bonuses, haulage allowances etc., insofar as this could be done, consistent with the public interest.

Outstanding accomplishments of UOPA include: a program to improve sampling techniques; solid backing of the $4.5-million mine access road program; and very effective support of the Aspinall-Dawson Bill. Much of UOPA's success is due to the legal and technical competence of its officers and leaders. (UOPA officers are shown above. Some of the Plateau people shown here are members.)

HELMAR JOHNSON, mill superintendent of the Monticello uranium mill.

OWEN MALIN, who staked claims during the Big Indian Wash boom.

CHARLES LINDBERG, superintendent of Kerr-McGee's Shiprock uranium mill.

CHARLES STEEN, president of Utex Exploration Co., talks to Floyd Odlum, President of Atlas Corp. which recently bought Vernon Pick's mine for $9-million.

DENNY VILES, VCA'S vice president and mine maker, with Navajo employee at work on the rich Monument No. 2 open-pit mine.

JOHN HERNDON, open-pit mine superintendent at Anaconda's Jackpile property.

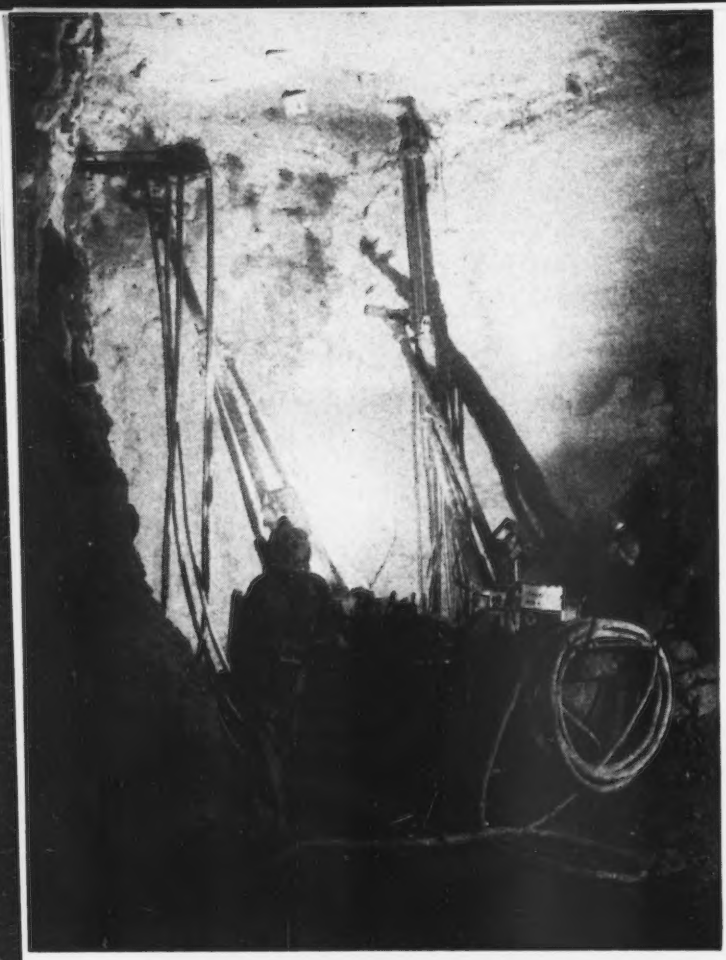
VIRGIL BILYOU, superintendent of Steen's Mi Vida underground mine, Big Indian Wash.

ROY TYLER, superintendent of the rich Vernon Pick mine, points out high-grade log.

W. T. HUDSON, vice president of Utex Exploration Co.

BLAIR BURWELL AND RAY SULLIVAN, veterans in field of exploring, mining and metallurgy, now head Minerals Engineering Co. serving Plateau operations.

PLATEAU PEOPLE



MINERS ON G&G LEASE OF MI VIDA PROPERTY use Hydro-Drill jumbo to drill blast holes and roof bolt holes in massive orebody.

JERRY COLLISON, geologist for Moab Drilling Co. demonstrates geiger counter.

JAMES A. RICHARDSON, project engineer at White Canyon exploration camp.

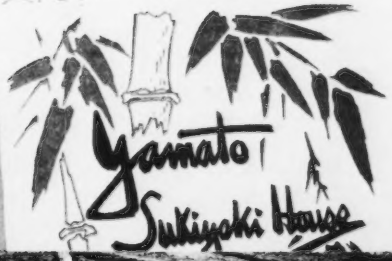
WELL-STOCKED geiger counter supply in Grand Junction.

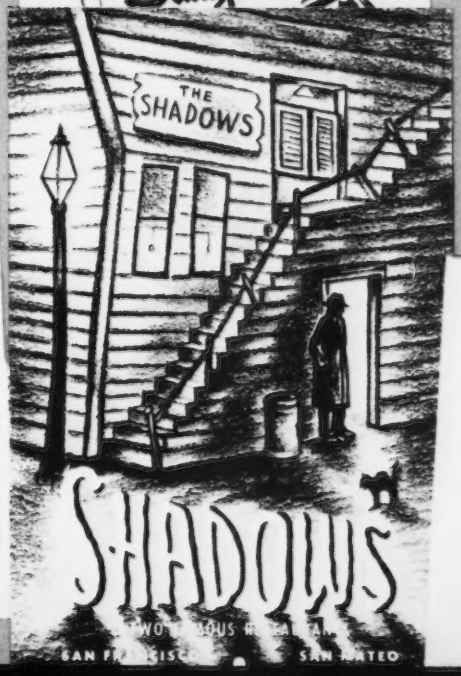
ARCHIE GARWOOD AND CLARE GERLACH who lease the G&G operations on Steen's Mi Vida property.

WOW—IT'S ALL ORE! is reaction of a group of visitors inspecting the Mi Vida 20-ft orebody in company with Virgil Bilyou.

ENGINEERING AND MINING JOURNAL'S HINTS ON . . .

Food and Fun in SAN FRANCISCO





Food and Fun in SAN FRANCISCO

Compiled By The Gourmets,
and
Edited by GEORGE TENNEY and ANNE SIMPSON,
All of
McGraw-Hill Publishing Co.,
San Francisco, Calif.

MINERS AND MOUNTAIN MEN, sailors and other seafarers, vaqueros and vagabonds, prospectors and peddlers, tourists and world travelers all have looked to San Francisco since the golden spark of 1848 as a mecca for food and fun. In the City by the Golden Gate good food is a tradition. Here the colorful personality and exotic beauty that is San Francisco—the sky, air, sea, hills, fog, sights, spirit and moods—are transmuted into food to tantalize the epicure.

Asked what in his opinion had established San Francisco as a gourmet's paradise, one veteran bon vivant once said, "Hell, we had to learn to eat out and like it. There were no good women to give us home cooking!" So it is that no city can boast of a greater variety of fine food or colorful and vigorous fun than the city of San Francisco.

In a city as cosmopolitan and Bohemian as San Francisco, eating takes on an international flavor. In addition to a cuisine that is strictly its own, the city boasts of rare and exotic dishes that range from Continental to Polynesian, Cantonese, Armenian and Indian.

For those who are strangers and for some who are not, here is a small selection from among the city's many restaurants—chosen because they are appreciated and loved by residents and remembered by visitors. There are others equally noted and equally well liked but space has limited the list.

For Dining

ALEXIS TANGIER (1200 California, TU 5-6400)—Alexis' menu says "we proudly present our own selection of exotic viands from the land of the magic carpet and romantic continent." In our opinion Alexis has not exaggerated. The setting, though small, is intimate, and all is in keeping with either Zakouska a la Russe or Turkish Pakhlava. A gourmet's wine list.

ALFRED'S (886 Broadway, SU 1-7058)—Famous for well-cured beef of which tons and tons are served weekly. This is the place for a green salad with wine vinegar and olive oil dressing, a broiled filet mignon, a bottle of good red wine and a dessert of cheese and coffee. Popular and sometimes crowded.

ALLOUETTE (1121 Polk, GR 4-2166)—A typically San Franciscan French restaurant where eating and drinking are a fine art to be enjoyed to the fullest. Here cooking with wine is at its very best. Try coq au vin with a fine wine from the well stocked cellars or close your eyes and pick anything on the menu. You will enjoy every bite.

BLUE FOX (659 Merchant, DO 2-9316)—Bon vivants claim that the best chefs in town rule the Blue Fox kitchens and few will argue the point. Basically Italian with superb salad dressings and sauces. The pastas—lasagna, tortellini and gnocchi would titillate the taste of any queen. Any of the specialties of the house is certain to please.

FISHERMAN'S WHARF — Here you must certainly go to see the steaming crab pots, the colorful fishing boats

and to sample a crab cocktail if nothing else. There are restaurants of all grades. Sabella Fish Grotto, where the lighting may not be of mood character and the decor uninspiring, yields to no one on the quality of its seafood. To be good, seafood must be fresh (literally alive) and Sabella's chefs honor the law. . . . Tarantino's, with a magnificent view of the fishing fleet and Golden Gate Bridge, offers all of San Francisco's noted crab dishes, as well as rex sole, sandabs and that special delicacy, abalone steak. No reservations and especially crowded on a Friday night.

GRISON'S STEAK & CHOP HOUSE (Van Ness & Pacific, OR 3-1888)—The name spells out the menu (except for mountain trout). A fine formula for eating and service has been perfected here. The salad dressing is well worth taking home and the lemon chiffon pie worth a trip to San Francisco. Across the street is another branch of Grison's — the Chicken House, specializing in fried chicken or roast beef to the accompaniment of hot biscuits and honey—m'm'mm'm.

HOUSE OF INDIA (629 Washington, EX 2-0744)—Small, intimate and authentic, this is one of SF's outstanding foreign restaurants. One can almost imagine that the bartender is a retired mahout of some Eastern potentate—with turban, he tops 7 feet (big elephants did you say?). They serve gimlets made exactly right and Pimm's Cups of all kinds. The curries are strictly Calcutta and the beefsteak and kidney pie very British.

JACK'S (615 Sacramento, GA 1-9854)—Typical old San Francisco (1864) and a haunt of the discriminating. Comparable to Gallatoire's in New Orleans for fine food, drink and service. Try any one of half a dozen chicken dishes, clams gourmet and fresh fruit for dessert.

MOARS CAFETERIA (33 Powell, YU 2-3353)—If you only stop for coffee and Danish pastry, the visit is warranted just to admire Beniamino Bufano's magnificent mosaic of St. Francis d'Assisi which covers one whole wall. It's a favorite place too to watch the cable cars, as gripman, conductor and passengers push them around on the tiny turntable at the end of the line.

NEW JOE'S (540 Broadway, EX 2-9979)—Decorated in homage to the grape, the catalyst of good Italian dining, New Joe's has a chef with a way with everything from a hamburger on toasted French bread to chicken cacciatora. End result is an epicurean masterpiece. Trouble is that everybody who is anybody knows this. But the

fine food is worth waiting for anytime.

NINO'S (225 California, GA 1-3062)—Owned by two former chefs of the Blue Fox this restaurant excels in Italian cuisine. Cold salmon aspic is a specialty and Pierre Monteux says the gnocchi a la Milanese is unequalled outside Milan.

PAOLI'S (347 Montgomery, SU 1-7115)—Located in the financial district where the psychological effect of fine food has never been underestimated, Paoli's serves the world famous Pisco Punch, as nearly as it can be concocted (because the true recipe died with Duncan Nicol). The table d'hote dinner with roast beef or chicken Raphael Weill is something long to remember.

PARIS LOUVRE (808 Pacific, GA 1-5157)—Credited with serving the best French food in the city probably because three French chefs own it. Adolf will aperitif you at the bar with his blue-ribbon-winning Gourmet Cocktail. Choose any of the French or continental dishes and top all off with a flaming dessert and cafe diablo.

PIRO'S (714 Montgomery, YU 2-3921)—Comparatively new, hence opulent decor and food in keeping with the atmosphere and elegance. Caesar salad, beef grenadine or rack of lamb (cooked to order for two) are suggested from a menu rich in good things.

SCHROEDER'S (111 Front, SU 1-9818)—To contemporary San Franciscans there has always been a Schroeder's where no women are allowed for lunch, where draught beer comes in beakers and if the food isn't German, it isn't chalked on the big blackboard, which is the only menu.

SHANGHAI LIL (1020 Kearny, SU 1-3400)—To those who know authentic Chinese cooking or who can discuss the menu in native tongue with the waiter, Shanghai Lil's may not be what you are seeking. But for quiet atmosphere and consistently delicious Cantonese cooking, it has no rivals.

SKIPPER KENT'S (1040 Columbus, PR 6-3737)—Owned by a fabled Twentieth Century buccaneer who has sailed the seven seas in three different legendary ships, this house is filled with Polynesian and Oriental treasures. Here is real "atmosphere" in subtly pleasant doses and the same applies to the food and drink. The curries are superb, the rum drinks sublime and the service magnificent.

THE SHADOWS (1939 Montgomery, EX 2-9823)—Owned by an expatriate Austrian, this showplace sits astride Telegraph Hill with a sweeping view of the Bay, the SF-Oakland bridge and Yerba Buena Island. Cuisine is German and they love to feed you sauerbratten and potato pancakes or smoked loin of pork and sauerkraut with thick split pea soup for a starter. The Shadows pudding, swimming in a wine sauce, is a house specialty, as is Munich beer.

TRADER VIC'S (20 Cosmo Place, PR 6-2232)—Rightfully listed as one of three great eating places in the U.S. In a Polynesian atmosphere and leisurely Oriental manner you can imbibe ecstatic rum drinks and eat Chinese, Polynesian or just plain American food. Gourmets take their wild ducks here to be broiled in the huge Chinese ovens right before their eyes. Let the waiter or Vic Bergeron himself help with your selection.

VANESSI'S (498 Broadway, GA 1-0890)—San Francisco's cuisine is permeated with Italian seasoning and this is the dean of the Italian restaurants. One may sit at a curving counter and watch chefs concoct veal scallopini or zabaglione—a fabulous dessert of eggs, sugar and Marsala wine. Or you may direct the cut of your own steak or even mix your own salad. It's a favorite eating place for visiting celebrities.

YAMATO SUKIYAKI HOUSE (717 California, SU 1-9724)—You go Japanese here—shoes left off outside

the room, kimonos donned and food consumed from low tables. The sukiyaki, or teriyaki if you prefer it, is prepared by costumed Geisha girls on braziers right before your eyes. For the less romantic and hardy there are tables and chairs. There's hot sake also to take care of such inhibitions.

For Dinner and Dancing, or Just for a Drink and the Show

BALALAIKA (960 Bush, OR 3-8976)—Emphasis is on Russian food although an excellent Caesar salad and steak can be had as well. Borscht, shishkabob and dessert pastry that might come direct from a Greek Catholic wedding festival, make a fine meal. Traditional Russian music fills the interludes between dances.

BIMBO'S 365 CLUB (1025 Columbus, GR 4-0365)—Noted across the nation for "The Girl (nude and alive)

in the Fish Bowl," its spacious bars and its good food. Bimbo's is tops for entertainment, dancing and all-out fun. The Moro-Landis Starlets and Derle Knox orchestra will be featured during the Mining Congress meeting.

ITALIAN VILLAGE (915 Columbus, PR 6-3467)—Consistently good headline talent, well-stocked bar and excellent food make this a standout for an exciting evening. Booked for September is Paul Whiteman and his band. If the dinner, dancing and show aren't sufficiently satisfying, the basement features Turk Murphy's jazz band with dancing to nostalgic tunes of the 20's.

LOCHINVAR ROOM (Mark Hopkins Hotel, EX 2-3434)—No floor show, but a delightful dinner and supper dancing room atop Knob Hill.

SINALOA (1416 Powell, SU 1-9624)—The dining is very good Mexican and the dancing is on a pocket-handkerchief-sized floor. Here the show is the thing, with torrid Mexican dancers and haunting Mexican songs.

VENETIAN ROOM (Fairmount Hotel, DO 2-8800)—Show, food and service fully justify the expense of an evening spent in this lushly decorated spot. If you enjoy the songs of Billy Eckstine, the experience will be doubly memorable as he is the headliner during the AMC meeting.

For Lunch

For San Francisco's businessmen lunch hour is 12:15; for its women anytime after 1 will do. Depending on your particular interest, consider this list of appealing places:

EL MATADOR (492 Broadway, GA 1-3348)—Quiet, intimate, very "cafe," this museum of tauromachy is owned by Barnaby Conrad, author and bull fighter who studied under Spain's great matador, Belmonte. Be sure to make a reservation.

EL PRADO (Plaza Hotel, SU 1-7200)—Noted for delicious large salads, fine prime rib roasts and a chicken dish sautéed with gin and fine seasonings served from copper-headed carts at your table.

MURAL ROOM (St. Francis Hotel, YU 6-2131)—Each Monday San Francisco's social register set meets here to see and be seen. For a glimpse of the city's best dressed and most beautiful women, it's the Mural Room on Monday. (Eggs Benedict if you insist on food).

PALM COURT (Palace Hotel, EX 2-8600)—Once the carriage entrance of this noted hostelry, this spacious, elegant gardenlike room is one of the city's finest lunch places. Recommended—a cocktail, a salad with Green Goddess dressing and a selection from the large pastry table.

PANELLI'S (453 Pine, DO 2-7198)—Catering to the financial district trade and serving delicious crisp salads and a variety of subtly seasoned entrees. Well stocked bar and knowing waiters.

RITZ OLD POODLE DOG (65 Post, EX 2-9958)—Since 1849 there has been a Poodle Dog restaurant owned by a French family. You'll not go wrong with onion soup, salad a la Jean or rex sole muniere.

TOMMY'S JOYNT (1023 Van Ness, TU 5-9877)—A lusty saloon for those lovers of tap beer, ham and cheese on rye, salami sandwiches and kosher dishes.

After 10 O'clock

Along about the shank of the evening for fun, for a drink or just for the hell of it here are some spots that are typically San Franciscan:

HUNGRY i (599 Jackson, YU 2-6470)—Run by an explosive Italian named Enrico and his White Russian wife. Superb entertainment, food and drink.

PURPLE ONION (140 Columbus, SU 1-0835)—Arty atmosphere where only champagne, wines and beer are sold and the avant garde lingers to expound between shows.

OPUS 1 (141 Columbus, SU 1-5526)—New club with a new idea—hi-fi classical recordings and "live" shows while sipping wine or beer.

BOCCE BALL (622 Broadway, SU 1-9507)—Go through the bar and out the back to watch the experts at this bowling game of tense moments and Italian expressions. Return to the main room to sip a drink and listen to operatic arias sung by SF's leading voices.

BUENA VISTA CAFE (2765 Hyde, GR 4-5044)—An old haunt with a new idea—delicious Irish coffee and imported beers, with enough Bay view to invite lingering.

PAPAGAYO ROOM (Fairmont Hotel)—Popular supper spot where cafe society meets cafe society; Mexican food is the menu feature; the bird city an attraction and Al Williams, the host, a legend.

PALACE CORNER (Palace Hotel)—In the Palace tradition of fine settings and quiet charm, the Corner is fun for a drink and dancing.

At Your Own Risk!

And without further comment, we list the following in the hope that our suggestions will include some of ALL that San Francisco has to offer to her guests:

BEIGE ROOM (831 Broadway, GA 1-1333)—Excellent female impersonations!

FINOCCHIO CLUB (506 Broadway, DO 2-9913)—The City's oldest female impersonator show.

GAY NINETIES (555 Pacific, SU 1-1899)—Ray and Be Goman produce heroine and villain type skits and community singing.

FORBIDDEN CITY (363 Sutter, DO 2-8648)—All Chinese floor show.

BLACK HAWK (200 Hyde, GR 4-9567) . . . **TIN ANGEL** (987 Embarcadero, SU 1-2364) . . . **DOWNBEAT CLUB** (90 Market, GA 1-9694) . . . **CLUB HANGOVER** (729 Bush, GA 1-0743)—These are exciting places for authentic jazz entertainment and are haunted by the "greats" in this field as well as by the aficionados.

Out-of-Town

Should you wander away from San Francisco's seven-by-seven mile area, may good fortune see you to any of the following:

Berkeley's Claremont Hotel cocktail lounge in late afternoon to watch the sun set behind San Francisco's fabled hills and the Golden Gate. . . . **Jack London Square** at the foot of Broadway in Oakland where midst modern decor stands the shack, **Last Chance,** a haunt of the great author. . . . **The Valhalla in Sausalito** with its mid-Victorian lounge and dining room presided over by one of San Francisco's most famous femmes—Sally Stanford. . . . **Sam's** in Tiberon to sit at tables on the flower-bedecked pier and watch the sailboats dock as the lights come on street-by-street in San Francisco across the bay. . . . **Estrada's Spanish Kitchen** in Daly City for the best Spanish food in the Bay area. . . . **Down the Peninsula** to enjoy any number of famous restaurants such as **Villa Chartier's Lanai Room, Rickey's Studio Inn, Ramor Oaks, Dinah's Shack, Scotty Campbell's** and ever so many others.

In Brief

There are in San Francisco a number of famous, historic and highly popular restaurants which have not been listed elsewhere in this guide. They need no introduction and are set down here for your convenience:

Omar Khayyam's (196 O'Farrell, SU 1-1010)—George Mardikian's world-famous Armenian restaurant.

Amelio Cafe (1630 Powell, SU 1-9643)—Its guest books have been signed by many of the world's greats.

Di Maggio's (Fisherman's Wharf, OR 3-2266)—The Yankee Clipper's very own.

Cathay House (718 California, YU 2-3388)—The tourist attraction of San Francisco's Chinatown.

John's Rendezvous (50 Osgood Place, DO 2-8375)—A favorite over the years with visitors for its dinners of many courses.

Roberts-at-the-Beach (2200 Great Highway, MO 4-4400)—Includes a museum of San Francisciana.

Larry's (493 Broadway, DO 2-9826)—Larry insists upon being the Mayor of North Beach.

Camille Restaurant (447 Pine, SU 1-9600)—Long a name and a tradition among San Francisco's eating houses.

Julius Castle (302 Greenwich, DO 2-3042)—Full course French dinners while perched on the side of Telegraph Hill overlooking the Bay.

Sears Fine Foods (529 Powell, DO 2-9938)—For their famous 18 little pancakes for breakfast—the recipe a guarded secret.

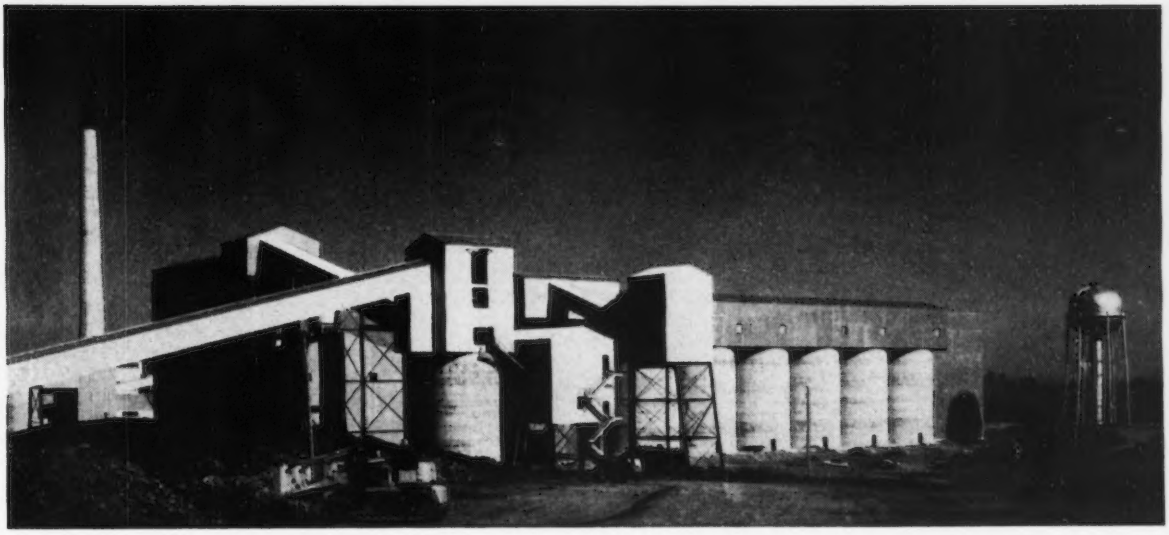
Wines

San Franciscans consume more wine per capita than folks in any other major U. S. city. Perhaps it is because good food and good wine go together. Or it could be because California's art of vine-growing and wine-making dates back to the Missions and the padres. It was in the 50's that the great family vineyards and wineries were established that today assure native wines that the discriminating gourmet will find the equal of any produced in Europe.

California wines are largely varietal—named for the principal grape variety from which the wine is made. Examples are Pinot Noir, Gamay and Isabella (Burgundy types); Cabernet and Zinfandel (claret types); Semillon and Sauvignon (sauterne types); and Traminer, Riesling and Sylvaner (Rhine wine types).

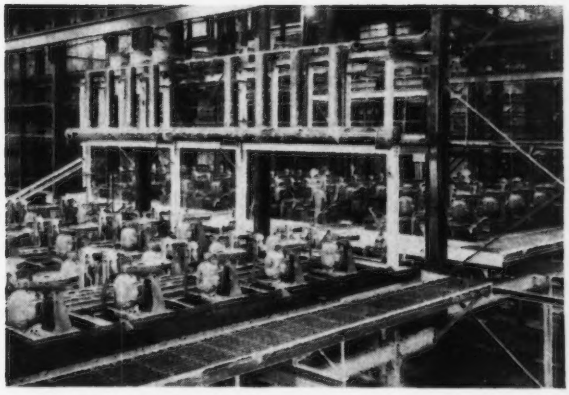
Some of the vintners whose wines are prized by connoisseurs are Wente Bros., Concannon and Louis Martini for whites and Beaulieu, Krug, Beringer, Inglenook and Fountaingrove* for the reds. An all-purpose wine of great popularity is vin rosé—the delicate pink wine which goes with nearly every dish. There are two varieties—Almaden Grenache Rosé and Martini Gamay Rosé. The notable California champagnes are Paul Masson, Almaden and Korbel.

*Fountaingrove Vineyards in Sonoma County have a direct link with California mining operations. They were owned by the late Errol McBoyle of the Idaho-Maryland and are still operated by his widow.

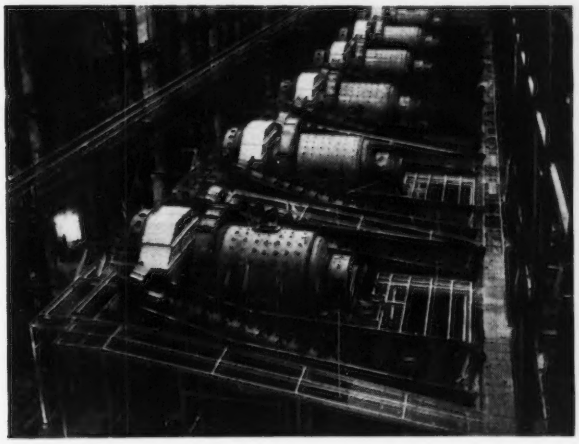


SMOKE, enough to indicate production, should issue from this new stack of White Pine Copper Co., White Pine, Mich., along in late November, when new smelter should begin operating. Mine's annual output will be 75-million lb of copper.

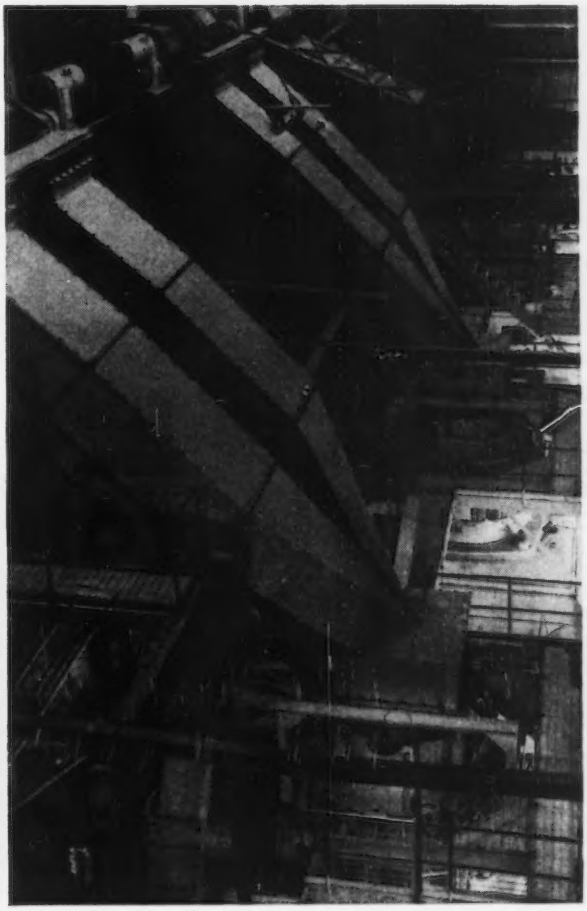
White Pine Nears Production



FLOTATION FLOOR, showing Fag rougher cells and cyclones for desliming rougher tailing for re-treatment.



HUGE ball mills (13x13-ft Marcys) were to begin rolling soon after Labor Day. Each holds 90 to 100 tons of balls.



SECONDARY CRUSHERS, 7-ft Symons, typify clean, dust-proof design of entire plant. Discharge to ball mills is ⅜-in.

Mining Show Preview

Here's a thumbnail sketch of who's exhibiting at the AMC Mining Show in San Francisco, Sept. 20-24. We've tried to give you an idea of what's being shown, who makes it, and who to see at the booth for more information. There'll be lots of new pieces of equipment being shown.

Aero Service Corp. (1128) C. M. Hodell. Hottest item here is the new relief model, the 3-D aid to mining engineer, geologist and management. A few of the current numbers will be displayed, along with Aero's magnetometer survey maps and topographic blowups

Allen-Sherman-Hoff Pump Co. (1015) William B. Stephenson Check in here to see the new Centriseal pump for abrasive and/or corrosive fluid-solid mixtures. The pump requires no gland seal water, is totally lined with easily replaceable parts of rubber or synthetic substitutes.

Allis-Chalmers Mfg. Co. (125-135-141) A. J. Schmitz. You'll have no trouble finding this spot. A-C's tractor division will be showing their big earthmoving numbers and they should provide a good triangulation point for you. Allis-Chalmers makes a complete line of processing and auxiliary equipment for the mining industry, including vibrating screens, Hydrocone crusher, Texrope drives A-1 jaw crusher, motors, controls and pumps, all featured at the show.

Alloy Steel and Metals Co. (1106) John M. McKean. The Pacific Slushmaster is the star of this exhibit, with the Round-the-Corner sheave block. A model (No. 2A-34) of the Slushmaster scraper will be on display. Pacific sheave blocks will be there in all sizes, along with a new heavy duty manganese steel front idler for crawler-type tractors.

American Air Filter Co., Inc. (1216-1220) John M. Kane. Big item at these booths is the AMERjet fabric arrester, with all improvements. It has been redesigned since the last Mining Show and has wider and newer applications in the field. Well worth your attention too are the firm's excellent dust collection units and oil bath cleaners.

American Brattice Cloth Corp. (120) D. Blaine Mikesell. American Brattice Cloth will have three short lengths of their Mine Vent Flexible Tubing delivering air from a blower fan right at the booth. Mr. Mikesell will have a supply of product catalogs.

American Manganese Steel Division, American Brake Shoe Co. (800) J. A. Brandenburg. One of the newest and most important developments in the welding field is the Amsco MF welder, which will be shown "live". MF stands for magnetic flux, an entirely new principle according to Amsco, and easily connected to your present welding machine.

American Mine Door Co. (160-162) Glenn D. Gurney. Before you spend too much time anywhere else, catch the first showing of the Model 40 Canton track cleaning machine for coal and metal mines. Action is the keynote at American Mine Door, with the 40 Canton and the electric track switch thrower both in action plus an animated background display.

American Wheelabrator & Equipment Corp. (826) L. L. Andrus, R. T. Pring. The highlight here is a cutaway of a full-sized No. 5 model 112 Dustube dust collector, which employs cloth tubes to filter air and for dust collection. A flowsheet in lights, portraying the collection of flume from a lead blast furnace, will be on display along with installation pictures of the company's dust collection systems.

Anaconda Wire & Cable Co. (915) Pete Peck. Processes of underground and surface mining shown in a three-dimensional diorama is the contribution of Anaconda to the show's excitement. They'll show the latest in mine cable, including an improved shuttle car cable; shielded and non-shielded mining cables.

Atlas Powder Co. (1011) J. H. Dannenberg. Number one here is the Shotmaster blasting machine. Of the generator-type condenser discharge genus, it's brand new. Other highlights are machine-gun photos of Rockmaster blasting techniques and the movie, "The Inside Story," to be presented at various times during each exposition day.

Baldwin-Lima-Hamilton Corp. (2019) T. A. Griffin The complete line of Baldwin-Lima-Hamilton products for the mining industry will be depicted in an extensive exhibit of photographs showing the equipment in use in all parts of the field

Band-It Co. (2001) Val Ladholm. The display here is the complete line of clamps, from ½- to 30-ft dia. Band-It is most enthusiastic about the universality of its line, including stainless steel and high carbon steel pressure clamps for mine use, hose clamps, pipe repair, split-beam repair and electrical cable line taps and welding cable splices, etc.

Barber-Greene Co. (611) W. H. Newton. Major item in the list of contributions to mine mechanization is the group of belt conveyor components, carriers, truss, terminals offered by Barber-Greene. The display is a guaranteed eye-catcher, with an animated conveyor idler display, showing six full-sized carriers and return rolls, and a self-aligning carrier puts on its own show. Here's a chance to pick up a scale model of B-G's bucket loader. One will be given away each day of the show to a holder of one of the tickets supplied at booth 611.

Bemis Bro. Bag Co. (510) I. D. Teter. We guarantee you'll come away from this display with a full knowledge of Flexipipe, the low-cost ventilating system for mines and tunnels. Bemis' show item features the collapsible ventilation tubing, with all accessories used to supply fresh air anywhere underground.

Bethlehem Pacific Coast Steel Corp. (923) G. M. Huck. Colby Howe, F. T. Saunders. Western mine operators will get their first real good look at the yielding arch section, a new type of mine roof support and featured attraction at Bethlehem Pacific's booth address. Company products for increased mine safety, haulage, production and profits will be shown.

Bico, Inc. (525) Joseph DePalma. Ask Mr. DePalma specifically about the Chipmunk crushers, UA pulverizer line and Calmix cupels and Inquarts, all highlights of the Bico display. Also featured will be flat belts, V-belts, (vertical and direct driven models), sieve shakers, assay furnaces, gasoline Cary burner, and propane burners.

Bixby-Zimmer Engineering Co. (2107) Ray Kaga. A new type of grizzly rod screen will hold the spotlight here. Central feature will be a scale model operating vibrator with BX welded stainless steel screens installed, showing general screen application.

Boyles Bros. Drilling Co. Ltd. (155) D. R. Montgomery. Here you'll find an extensive display of surface and underground diamond drills. Be sure to see Boyles' BBS-1 surface diamond drill with folding mast.

Broderick & Bascom Rope Co. (410) Fred Zimmerman. Yellow Strand wire rope and braided safety slings are major points of interest in this display, built by Rhodes Smith. There's an illuminated section of the rope as well as moving translites depicting Yellow Strand wire rope application in the metal mining field. You can talk to Mr. Zimmerman, J. J. Sieber, Thomas Verhoef or Robert Boag.

Brunner & Lay, Inc. (514) John Neamand. Intra-Set, the carbide inserted drill steel, will occupy the place of honor here. Intra-Set is available in gage sizes 1¼-in. through 2½. Featured item No. 2 will be the famous line of tungsten carbide Rok-Bits, cross and chisel types, all available in gages 1¼- through 4-in. Mr. Neamand will share the booth with Bill Schaefer, Tom Craig, George Hazen, Irving H. Rauw, Fred J. Brunner and Ed Quiett, all of whom can provide full information on Intra-Set and Rok-Bits as well as the long hole drilling tools, Sabur points and carbide Whirli-Bits which are also featured at the booth.

AMERICAN MINING CONGRESS ADVANCE PROGRAM

(All events, except where otherwise indicated, will be held in the Civic Auditorium)

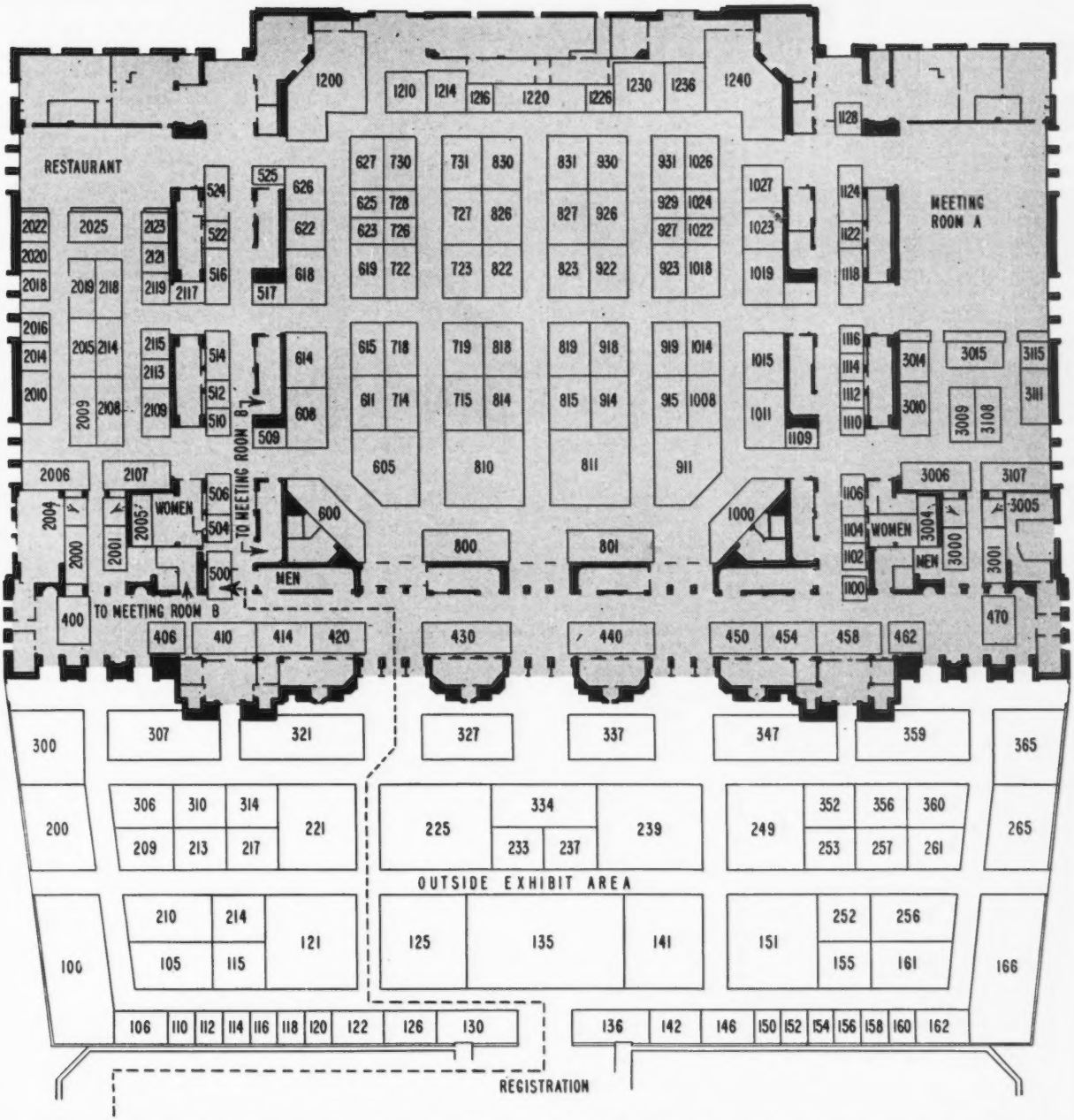
September 20
- 10 a.m. Opening session
- 2 p.m. Labor and Personnel Problems: Public Relations, Polk Hall
- 2 p.m. Geology and Exploration, 2nd-floor meeting room
- 2 p.m. Round Table Conferences

September 21
- 10 a.m. Public Lands Panel, Polk Hall
- 10 a.m. Nonmetallic Minerals, meeting room 301-2-3
- 10 a.m. Drilling and Blasting, 2nd-Floor meeting room
- 2 p.m. Stockpiling; Tariff, Government Mineral Programs, Polk Hall
- 2 p.m. Uranium Exploration and Development—Colorado Plateau, meeting room 301-2-3
- 2 p.m. Underground Mining Methods, 2nd-Floor meeting room

September 22
- 10 a.m. Taxation; Gold, Silver and Monetary Policy, Polk Hall
- 10 a.m. Mining and Metallurgy of Uranium, meeting room 301-2-3
- 10 a.m. Underground Mining Methods, 2nd-floor meeting room
- 2 p.m. Uranium Industry and AEC Program on the Colorado Plateau, Polk Hall
- 2 p.m. Milling and Metallurgy, meeting room 301-2-3

September 23
- 10 a.m. Outlook for the Mineral Industries, Polk Hall
- 10 a.m. Open-Pit Mining, meeting room 301-2-3
- 2 p.m. New Developments in Uranium—North America, Polk Hall
- 2 p.m. Milling and Metallurgy, 2nd-floor meeting room
- 2 p.m. Open-Pit Mining, meeting room 301-2-3

September 24
- 10 a.m. Tax Forum, Mark Hopkins Hotel
- 10 a.m. Minerals Beneficiation Division, Fairmont Hotel



Follow this line to *E&MJ's* booth for your copy of "Food & Fun in San Francisco" and "U_3O_8—Formula for Profits." And use the above plan to find your way to the other top-flight displays in all parts of the Civic Center Auditorium.

Bucyrus-Erie Co. (911) Over to the right as you enter . . . over there where all those people are standing. That model is one-twelfth scale of Bucyrus-Erie's 6 cu yd 150-B electric shovel. It performs all shovel functions—hoist, swing, crowd, retract and propel. An operator's station from the full-size machine will control the model.

Buda Co., Division of Allis-Chalmers, (930) C. H. Riding. Diesel engines with torque converters for powering mining and haulage equipment is the forte of Buda Co. and they prove it with the new Model 8DAT-1125 turbo-charged diesel engine, especially designed for haulage and mining trucks, and the 6DA-970 shovel power unit with torque converter, for shovels, draglines and cranes.

E. D. Bullard Co. (1118) E. W. Bullard Jr. A new item with application in every field where cranes, hoists and hooks of any kind are used is the Bullard-Burnham safety hook. Ask Mr. Bullard to show you the full line of mining safety equipment, including glass fiber and aluminum safety hats and caps, first aid kits, safety belts, face shields, protective clothing, blasting hoods and fresh air purifiers—and the Tacco safety truck step.

C&D Batteries, Inc. (150) Howard Toncray. The stationary battery for control, switchgear and auxiliary power applications is C&D's pride and joy. Not a reworked or slightly modified model of a battery designed for other service, the new stationary battery, they say, was specifically designed for this application. Mr. Toncray suggests you spend some time looking at the C&D Slyver-Clads, too.

C. S. Card Iron Works. (506) David C. Card. Operating models of various types of mine cars and locomotives in simulated mining conditions are featured at 506. The entire display is built on a scale of approximately ½-in. to 1 ft, with special attention to detail of cars, trucks, wheels, skips, etc. And the star of the model layout is certainly the beautifully carved Granby-type car complete with retracting dump block operated on low air pressure. It was carved from oak by Jerry Labbe, a Card engineer.

Caterpillar Tractor Co. (249-256-257-261-352-356-360) J. J. Valentine, J. W. Mohler, R.D. Evans, William Kusz, M. E. Fearis, W. H. Hogan, B. Haggjund, F. S. Foster and F. McNamara. Caterpillar is really represented at the show with the D8 crawler tractor (equipped with Gardner-Denver air compressor model WH-600-TM) incorporating tractor-mounted drills; Cat No. 6 shovel with heavy duty 2-yd bucket; rubber tired DW21 teamed with

Athey PR21 Rock Wagon, featuring rear dump facilities; 100 kw D337 diesel electric set; and two cutaways—one of the Cat D397 and one of the oil type clutch.

Chicago Pneumatic Tool Co. (1210-1214) This exhibit features the full line of Airleg-Sinker drill combos, including aluminum and steel legs and feeds with attachable or integral sinker drills, the pressure-balanced feed leg throttle, and hard-hitting CP sinker drills in 35-, 45-, and 55-lb classes. The Rotauger, a new rotary air drill for softer formations drills $2\frac{1}{2}$-in. holes at 2 to 4 fpm down to 100 ft.

Chiksan (166) E. Nelmes Thomas. The Chiksan Intelli-Giant hydraulic mining gun takes top billing. A full scale unit of the Intelli-Giant will be seen at the booth, in addition to a small model which visitors may operate. Chiksan's regular line of ball bearing swivel joints, unions and drilling equipment will also be on display.

Christensen Diamond Products Co. (2114) Ross C. Clay. The series C-2 core barrel makes its debut here and it's well worth seeing. But don't think you've seen all there is to see after you've studied C-2. You can't afford to pass up the vast line of core bits in all diamond sizes and concentrations, matrix hardness and waterway arrangement; the insert and balanced reaming shells (plus examples of hardfacing on shells); and the casing shoes and casing bits. Take your time . . .

Cleveland Rock Drill Division, Westinghouse Air Brake Co. (919-1014) N. W. Rinker. Cleveland's nomination for the favorite mining machine in the industry is the H10-AL air leg, which will be featured at the Mining Show along with the complete new range of single extension and telescopic drills, including the AL-90. Bowing in at San Francisco will be model H12, the brand new 55-lb hand-held drill, and the new 90-lb stoper drill, model S12. The latter will be available in "in line" or "offset" leg models.

Coast Manufacturing and Supply Co. (504) F. W. Nelson. Application of Spittercord to rotational firing of Safety Fuse rounds from single ignition point is the headliner in the Coast exhibit. Ask Mr. Nelson for literature on Safety Fuse, Primacord and Spittercord and for the dope on blasting accessories.

Columbia-Geneva Steel Div., U. S. Steel Corp. (810) H. B. Montross, Jr. A strong new ally for the mining industry, USS Carilloy T-1 Steel, will be shown in addition to various other products. The strength and toughness of USS Carilloy T-1 Steel reportedly will give increased production and lower operating and maintenance costs.

Colorado Fuel & Iron Corp. (1110-1112-1114-1116) Harmon H. Davis. Products as such will not be displayed, but . . . well, let them tell it. "CF&I is happy to extend a cordial invitation to all visitors to the show to its hospitality center. Comfortable seating will be at your disposal, and telephone service will be available to all who wish to use it. A complete secretarial service will be adequately staffed to write letters, send telegrams, place and receive long distance calls and make hotel and transportation reservations. An information center will be maintained to answer questions in regard to the mining show. We will be looking forward to serving you at our hospitality center".

Conveyor Co. (217) R. H. Robinson. Visitors to the Conveyco booth will get a "sneak preview" of two new products . . . the Conveyco conveyor scales and screen. They will not be introduced to the trade until after the show. Two types of scales will be in operation and heavy duty rolls and the screen will be on display.

Copco Pacific Ltd. (3006) Paul Snow. Copco will display a collection of mineral-bearing ores from mines where its equipment is used and a novel latticework of drill steels that illustrates, among others, its flexible steels. Making its first "walk on" will be the new line of Coromant detachable rock bits. The rest of the cast will be the full line of Atlas rock drills, Coromant drill steels, and the new AR series compressor.

Crucible Steel Company of America (600) R. W. Persons. Crucible will show hollow drill rods with a special panel mounting cutaway sections to illustrate manufacturing processes. Besides a full display of the mining applications of Trentweld stainless steel tubing, Rezistal stainless steel Rexweld hard surfacing rods, Max-el machinery steel and drill bits made of Hy-Tuf nickel alloy steel, the booth will feature a chunk of uranium ore. Geiger counters will be provided to let booth visitors take a guess at the dollar assay.

Cummins Engine Co., Inc., (430) J. W. Rowell. The new and exclusive Cummins PT fuel system is the star of this exhibit, says the company, with the advantages of lower maintenance costs and overall economy. An actuated cutaway of the diesel engine will be shown with the diesel injection pump working. There will also be a setup for assembling and dissembling.

Dart Truck Co. (101-252-256) Mark T. Kasper. "Introducin' . . . the sensational new model 35SA, 35-ton end dump truck . . . featuring the revolutionary air strut front suspension with side-mounted 388 hp butane engine." In addition, model 20-S, 20-ton, and 10-S, 10-ton trucks will be shown. All have shorter wheelbase, better riding qualities and improved driver vision.

Denver Equipment Co. (516-522) J. H. Gisler. Stop by and see the No. 24 Denver "Sub-A" super rougher flotation machine, featuring the new suspended unit shaft assembly, designed for simple efficient operation in handling high tonnage bulk flotation. Along with the automatic sampler, Denver's precision machine with its wide range of applications, you'll see the 16-in. Denver-Finney classifier, a new belt-type of revolutionary design, and the wet reagent feeder.

Detroit Diesel Engine Division, General Motors Corp. (1200) J. C. Campbell, M. Q. Fullington. With a purpose "to further acquaint mining people with the advantages of using GM diesel engines, to accelerate use of GM diesel-powered end products in the mining industry, and stimulate sales of these stationary units supplied by our industrial distributors", Detroit Diesel will show cutaways and models of GM 2-cycle diesels.

Dings Magnetic Separator Co. (2006) K. L. Gille. Drum and belt-type wet magnetic separators, as used by leading mining firms throughout the world in taconite beneficiation and heavy media cleaning plants, will be the focal point of this display. Enlarged photos, a series of stereo slides and operational data of many applications will be shown with particular emphasis on application of the Alnico alloy permanent magnetic separator.

Dodge Manufacturing Corp. (3111) L. O. Carroll. A large mock-up of the Taper-Lock bushing, "interchangeable in a variety of products," will be shown at the Dodge booth, along with a sectioned Taper-Lock solid steel conveyor pulley showing the internal features of the drum-type construction. It will be mounted on Dodge-Timken all steel pillow blocks, one of which will be cut away to show Timken roller bearing design. And sharing the spotlight with these headliners will be the Dodge Torque-Arm speed reducer, equipped with Tri-Matic overload release.

Dunkin Blue Print & Supply Co. (3004) J. E. Dunkin. Featuring the newly-developed 3-D mine mapping system, the Dunkin exhibit will show the most complete stock of uranium maps and publications. Their current "Catalog of Maps and Prospectors' Supplies" will be available and Babbel's deep hole probing and recording equipment and a Keuffel & Esser mine surveying transit will also be exhibited.

E. I. duPont de Nemours & Co., Inc. (801) S. M. Strohecker, Jr. You don't need us to tell you that DuPont will have one of the leading displays and that you can't afford to miss it. This year they'll feature blasting agents for open pit mining, MS delay electric blasting caps, DuPont CD blasting machines for electric firing and Thermalite "Ignitacord" for increased safety in spitting fuse in drift rounds.

The Eimco Corp. (151) J. K. Russell. Eimco will unveil some new pieces of equipment, in addition to its heavy duty mining, milling and construction equipment.

Electric Steel Foundry Co. (2108) Norval Grubb. ESCO two-piece renewable teeth with brand new special features designed for the mining industry will be displayed in large industry photos and other products, including stainless steel piping, valves and fittings for corrosive liquids and heat resistant castings for ore processing systems will be on exhibit.

Engineers Syndicate, Ltd. (3001) Walt Bilicke and Randolph J. Hubka. If you're interested in finding uranium (and who isn't?), check in here to see some of the latest developments in uranium exploration equipment. Ask Walt Bilicke to show you his Model SC-8 Scintillation Counter and Model SAB-7Airborne Scintillation Counter.

Equipment Engineers Inc. (470) Richard Krebs, Bob Clarkson. Various models of Krebs cyclones will be on exhibit, featuring advanced designs in dynamic classification Sharing the booth will be the Clarkson reagent feeders, presenting a new service offered by this well known device, now in operation in more than 1000 milling plants.

Engineering and Mining Journal (500) Carl Consh. Stop in here for an extra copy of "Food and Fun in San Francisco," and for reprints of the entire "U_3O_8-Formula for Profit" section of this issue of *E&MJ*.

Euclid Division, General Motors Corp. (714-225-334-233-737) R. E. Keidel. Euclid will place full emphasis on the use of their scrapers for stripping and rear dump trucks for haulage. These units are being used in increasing numbers for open pit mining and, with their offering of low cost haulage, combine to present a deal you can't ignore. Model S-7, the new 7-yd overhung scraper, will be on exhibit at the show along with the twin power 18 cu yd scraper and the famous 22-ton rear dump Model TD truck.

Exide Industrial Division. The Electric Storage Battery Co. (718) T. H. Dooling. "Your best power buy at any price!" is the motto for this display, featuring the Exide-Ironclad battery, which the company says is improved for mine locomotive service with Silvium and Polyethylene. The use of Silvium (an exclusive new alloy) and extensive use of polyethylene in tube sealer and Ironclad tubes assures the user of lower operating costs, says Exide.

George E. Failing Co. (221) H. J. Godschalk. A new drilling rig, especially designed for the fast drilling of blast holes, the CBH Holemaster, will be the main feature of the Failing Co. exhibit. A self-contained unit, the Holemaster is said to combine the hydraulic chain feed with the use of compressed air and produce holes that are easily positioned and uniform in size and depth.

Femco, Inc. (1102-1104) Warren Sprague, Carl Marquardt. Industrial Physics tramp iron detector, Vincent proximity alarm and Femco's extensive line of carrier equipment, Audiophone, and automation devices for safe, efficient operation, are the headliners here.

Fisher Research Laboratory, Inc. (1109) George M. MacLeod. A large variety of portable geophysical equipment with special application to mining exploration problems will be pointed up at the Fisher booth. Along with their full line of geiger counters, the re-

search firm calls particular attention to its refraction-seismic equipment, which they feel shows tremendous promise in the mining field. Electromagnetic and ultra-violet equipment will also be shown.

Flake Brothers Refining Co., Lubriplate Division. (3010) H. E. Van Bevers. No matter how extensively you're using Lubriplate at your installation today, Mr. Van Bevers can probably show you new applications and uses. The exhibit at his booth will have moving displays and charts. Check on Lubriplate No. 630-AA, it's waterproof, has high load-carrying ability and melts at 400 deg F.

Flexible Steel Lacing Co. (2025) John P. Ramsey, Newton R. Crum. Booth 2025 will highlight Flexco HD belt fasteners and hinged Flexco belt fasteners, and will be built around the company's 19-ft incline conveyor. The 24-in. troughing conveyor belt will demonstrate the application of the wide range of Flexco belt fasteners.

Flexible Tubing Corp. (146) Howard W. James. Spiratube-M and Ayrtube are the stars of this showing, both created for ventilation where usage is rough. Spiratube-M is flexible, light, and made of reinforced fabric; it can couple and uncouple rapidly and provides unimpeded flow around bends. Ayrtube is a heavy-duty pressure tube made of sturdy, neoprene-impregnated fabric. It resists abrasion, water and corrosive chemicals.

Galigher Co. (3107) S. L. Evans. Just a list of the items at the booth should give you an idea of what's available here: Vacseal pumps, Galigher acid-proof sump pumps, Agitair flotation machines, Geary-Jennings samplers, Davis patented agitators, ore dressing equipment control panels and a model sample mill, rubber fittings and laboratory Agitair flotation machines. Most will be in operation. Included will be a complete automatic working model of a sample mill with full control panel.

Gardner-Denver Co. (810) J. A. Caverly. Suffice to say that Gardner-Denver will supply a great deal of interest and excitement with many new models of drills and drilling equipment, hoists, loaders and pumps. Budget your time so's you can really loaf around booth 810, it could be important for you and your property.

Gates Rubber Company Sales Division, Inc. (2109-2113) Jack Pilcher, Irwin Cone. Gates offers "a new and better solution of corrosion and abrasion problems . . ." and says "we are setting up a complete fabrication shop to show you, on the spot, the various ways in which rubber faced plate can be fabricated . . . Prepared samples of this technique will be available."

General Cable Corp. (130) R. C. Fellows. "Super Service" heavy duty portable cords and cables, built for the rough treatment that mining demands, is the big item here. Mr. Fellows will demonstrate type MI, safety mineral-insulated cable and he calls your attention to the product board display of poly wire.

General Electric Co. (927-929-931) R. D. Ketner. GE has a display for mining men, highlighted by a new model underground 1½-ton trammer and a comprehensive motor display. And when these boys say comprehensive, they *mean* comprehensive. There'll be motors for driving flotation cell impellers and slusher hoists, for conveyors and shovel equipment, and even for use under unusual conditions in taconite beneficiation plants. Check with Mr. Ketner on the operating speed-variator and the two-way mine radios, mine lights, wire and cable.

Goodman Mfg. Co., Mancha Storage Battery Locomotive Division. (823-922) J. D. James. Mancha would like you to look over their 9-ton storage battery locomotive with an eye for application at your property. It's built for 18-in. gage, with 54 hp, a 68 kwh battery capacity and a 2000-lb draw bar pull at 6 mph. But that's not all. At the Mancha booth you can also see the 1½-ton Mancha Little Trammer, with the new cam operated controller, improved design lever brake and deadman foot switch; and the 6-ton Mancha diesel locomotive with torque converter and water scrubber for underground.

Gould-National Batteries, Inc. (814) Featuring the "plus performance plan" booklet, a collection of material contained in carefully selected files on means to obtain longer battery life and better performance. There will be helpful "how to" dope on battery selection, charging, maintenance and repair under the plan, and various types of batteries for your examination.

Gustin-Bacon Manufacturing Co. (118) William Teague. Gruvajoint, the new light weight, grooved-end pipe coupling, takes upstage at the Gustin-Bacon booth, along with the 1000 Gruvagrip and the 1000 Rolagrip coupling for plain pipe. Supporting the featured items will be the complete line of pipe couplings and fittings for grooved end pipe.

Hardinge Company, Inc. (1124) F. W. Lutter. A glass model of the Hardinge Tricone mill will illustrate ball segregation at this booth, with a second model illustrating the "auto-raise" action of the thickener, and a plexiglas model of the Automatic Backwash sand filter, complete with circulatory system, all in full operation. Also included will be an animated flowsheet and an illuminated photo background, showing industry applications of the full Hardinge line.

Harnischfeger Corp. (605) Tom Jeanneret. Making its debut at the Mining Show will be the Harnischfeger "Electronic Stepless Control" for P&H electric shovels. Actual standard controls, as used on the new P&H model 1800 8 cu yd mining shovel will be set up for you to operate. You'll also get a chance to take a lingering look at the P&H model Magnetorque and the P&H welders and hoists.

Hazard Insulated Wire Works Division, Okonite Company (2015) Thomas R. Welchel. Mr. Welchel, Hazard's mining electrical engineer, will be standing by to answer your questions. Ask him particularly about Hazacord portable cables and the construction which gives additional life in the roughest locations.

Hercules Motors Co. (1000) William Brumback. There will be five models of Hercules engines and power units, representing the complete line; 3 to 500 hp, 32 series and 70 models, gasoline and diesel. Applications of diesels in many areas and under different conditions will be discussed at the booth.

Hercules Powder Co., (730) George B. Bassert. Another first for the mining show is the Hercules Titan Blaster, a condenser discharge-type blasting machine. Other panels illustrate explosives and blasting supplies, including Hercomite, Gelamite, the 23G Timesaver package, V.A.O. blasting meter, regular No-Vent delay, short-period delay and regular electric blasting caps.

Hewitt-Robins, Inc. (307-321) R. H. Jackson. Special attraction here, among the Eliptex and Vibrex screens, Heavy Duty Car Shakeout, electrically heated vibrating Gyrex screen and the new small vibrating conveyors, will be the Robintronic level indicator. The Robintronic shuts off feeders when chutes clog or bins fill; raises telescoping chutes as the pile rises. You'll also see a 45-ft mine conveyor in action

Houston Technical Laboratories. (2005) John Weber. Be sure to see the "HR" system, a completely new seismic system designed specifically for the mining industry as an extension of the seismic technique pioneered by HTL's parent company, Texas Instruments Inc., in petroleum exploration 25 years ago.

The Humphreys Investment Co., Engineering Division. (1224 and 1226) Merrill Welker. Here you'll see the famous Humphreys spiral concentrators in action, showing this ingenious device separating titanium and other heavy minerals from sands. Humphreys is proud of the concentrators' low first-cost, small floor space, low operating and maintenance costs and their dependable trouble-free performance.

Ingersoll-Rand Co. (1230, 1236 and 1246) L. H. Geyer. Any mining man who has ever drilled a round will not need any introduction to I-R products. Pick up I-R's new Carset jackbit. Run your finger over the fine cutting edge. And while you're there, notice also the new developments in the various types and sizes or air tools, pumps and compressors.

International Harvester Co. (105, 106, 110, 112, 114, 115, 116, 210, 214) Harry E. Broadwell. One look at International Harvester's earthmoving equipment and you'll tell those mountains to move over. On display will be an International 2T-75 Tractor with 2W-75 bottom-dump wagon, an International TD-24 Crawler with Cable Bullgrader, a Hough HRC Payloader, an International TD-9 Crawler with Drott Skid-Shovel, an International UD-9 diesel power unit with generator, U-282 carbureted power unit, a cutaway model of an International UD-14A diesel power unit and a scale model of a Hough Payloader.

International Nickel Co., Inc. (406) J. R. Davis. You'll feel like a judge at a photographic contest while looking around this booth. Inco has arranged 12 beautiful photo-enlargements depicting some of the many new uses of nickel and nickel alloys in the mining industry. Included will be applications of nickel in rock drills, crusher shafts, mine cars, skips, grinding mill liners and balls, classifier equipment, pumps, piping and welding rods.

Iowa Manufacturing Co. (126) O. E. "Bud" Whitney. Be sure to dig the CEDARAPIDS Double Impeller Impact Breaker. It boasts a new principle in breaking material against material thus reducing crushing costs—and what mining man isn't interested in reducing costs? The breaker gives greater crushing capacity also.

Jeffrey Manufacturing Co. (811, 815, 819) J. E. M. Wilson. Interest here will be heightened by the fact that all equipment will be in operation. You'll have a chance to examine Jeffrey's 80-A belt conveyor, Aerodyne Fan for general mine ventilation and blowers for auxiliary ventilation, Electric Vibrating Feeders for regulating feed to processing units and a Mud Hog Crusher with traveling breaker plate for crushing wet, sticky materials. Another word about that 80-A belt conveyor: It's 36 in. wide and 56 ft long and it has a pneumatic takeup which automatically keeps the belt in tension at all times.

Jet-Lube Inc. (2117) Frank E. Bergeron. Jet-Lube offers a complete lubricant service. Ask about Jet-Lube "AP-5" non-melting all purpose grease. This lubricant features a multi-purpose grease covering 85%-95% of general lubrication and contains micro-ground molybdenum disulphide for lowest coefficient of friction.

Joy Manufacturing Co. (618, 625, 626, 722). Joy products are old friends to both mine operators and the miners themselves. But something new has been added: a new rotary drifter for long-hole drilling; an entirely new type of blast hole drill for open-cut drilling; new electrical connectors and a new start-and-stop electric control, remotely-operated, for electrically-driven slusher hoists; new belt conveyor idlers said to be unlike any built to date; a new type of mobile drilling rig for underground drilling which mounts Joy's latest type of remote-control, extensible "Hydro-Drill-Jibs" with power lift and power swing; one of Joy's completely new line of two and three drum slushers, or portable hoists; two of the latest Joy airlegs with push-button control and mounted LM-47 drills, plus new designs of Joy-Truco diamond core bits and various models of improved Joy fans, blowers, single-drum hoists, stopers, drifters and breakers.

Kansas City Structural Steel Co. (517) N. W. Funk. Photographs will tell the story of mine and smelter structures fabricated and erected during the past two decades.

Kenworth Motor Truck Corp. (365) H. W. Dennison. Shown here for the first

time will be Kenworth Model 802 diesel-powered end-dump truck. This truck embodies many new design features and is a time-saver. Its combination of torque converter and Torqmatic brake makes it possible to negotiate both favorable and adverse grades at highest permissible speeds, thereby resulting in low-cycle time and minimum maintenance.

Koehring Co. (359) E. J. Goes. Center of attraction will be the Koehring Dumptor, a rugged 6 cu yd hauling unit that provides low-cost, high-output performance in underground mines, on open pit ledges and on narrow haul roads. The sturdy Dumptor has more than 6 hp for every ton of gross weight and can take grades up to 24% with full loads. Such a truck can be a powerful right arm for any mining operation.

Krough Pump & Equipment Co. (462) Krough Pump will be showing their complete line. Sharing booth 462 with them will be the Reeds Pulley Co.

LaRoe Instruments, Inc. (512) Robert S. Foote. On exhibit will be various types of both portable and fixed-installation scintillation detectors.

LeRoi Co. See Cleveland Rock Drill

Leschen Wire Rope Division, H. K. Porter Co. (524) Dalmarr G. Berglund. Mr. Berglund will be glad to explain in detail the illuminated background of photo-enlargements of both industry and plant pictures. Hercules is synonymous with strength. That's why Leschen has given the name of Hercules Red-Strand Wire Rope to one of its products.

LeTourneau-Westinghouse Co. (200, 209, 213, 306, 310) Dan Burke. You might think of this exhibit as the "Tired-Feet Special." You'll get a chance to sit down here while viewing a full-color, continuous movie, prepared especially for this show. Two top products are the Tournapull rear-dump hauling unit (rubber-tired, 208 hp and 18-ton capacity) equipped with constant mesh (Tournamatic) transmission, 24x25 24-ply Rock Grip tires, cab, Electrotarder and Quarry Bed; also a Model C Tournatractor (rubber-tired, 200 hp, speeds to 19.2 mph, equipped with bulldozer blade, torque converter and Down Pressure attachment. LeTourneau-Westinghouse also will provide you with illustrated literature.

Link-Belt Co. (818) L. O. Millard. The importance of belt conveyors—for high or low capacity, long or short haulage—will strike the keynote of this exhibit. A large display will show in cross section a 60-in. wide belt conveyor capable of handling iron ore at 100 tpm. Background of the exhibit will include large colored pictures of the 6000 tph ore handling system installed at Puerto Ordaz, Venezuela, by Link-Belt for Orinoco Mining Co., a subsidiary of U. S. Steel Corp. Also to be shown are pictures of Link-Belt vibrating screens, feeders, car dumpers and heavy-duty power transmission equipment for the mining industry.

Link-Belt Speeder Corp. (627) R. B. Barnes. Prime attraction here will be a demonstration of the Link-Belt Speeder Speed-O-Matic power hydraulic control system for shovel cranes. Complete operation from operator's control to actuation of clutches and brakes is visible by use of transparent sections of various components. Also on exhibit will be a 1-in. to 1-ft scale model of a Link-Belt Speeder K-375 1¼-yd dragline. Pick up literature here, too, on Link-Belt Speeder's complete line of shovel-cranes with ½- to 3-yd and 6- to 60-ton capacities.

E. J. Longyear Co. (454) H. A. Kurtze. If you're planning any diamond core drilling, check in here. On display will be a new diamond core drill designed for exploratory core drilling of AX size holes to depths of 4000 ft. This drill is especially suited for use with the spanking-new Longyear Wire Line Core Barrel, which will be shown also. Another display will emphasize Longyear consulting services, particularly the use of photogeology.

Ludlow-Saylor Wire Cloth Co. (1122) E. S. Robson. Examine the expert craftmanship in the Rek-Tang, Sta-Tru, Sta-Clear and Sta-Smooth Mining Screens. The same applies to the assortment of square-opening and square-mesh grades of industrial wire cloth, which Ludlow-Saylor is showing in cooperation with its California subsidiary, Star Wire Screen & Iron Works Inc., of Los Angeles.

Mayhew Supply Co. Inc. (165) J. T. May. Haul yourself into this booth to see Mayhew's truck-mounted portable rotary drilling rigs for blast-hole and core-drilling.

Mine Safety Appliances Co. (440) C. M. Donahue. For safety's sake, don't miss this one. MSA will feature Edison-Electric cap lamps and the latest in mine communication systems. Both the MSA MinePhone and the MSA HoistPhone will be shown. The MinePhone enables instant voice communication between the dispatcher and all motor men while trips are underway. The HoistPhone assures accurate, instant response between the hoisting engineer and the cage. Both systems are free of transmission noise and outside interference.

Marion Power Shovel Co. (614) Harold E. Bonecutter. Speak of Marion and you automatically speak of power. Marion intermediate-size shovels Nos. 4161, 151-M and 191-M will help you dig deeper, more efficiently, even in tough material. Marion is meeting the trend toward larger and stronger units. You'll get a preview of tomorrow's shovel at this booth.

Mining Congress Journal (3115)

Mining World (1100)

Motor Generator Corp. (150) Howard Toncray. You'll get a charge out of the exhibit of this Hobart Brothers affiliate. Detailed information about and examples of Hobart Automatic Battery Chargers for industrial and mine locomotive batteries will be on hand. Ask particularly about Model 671-20-IL single-circuit automatic motor generator set of 2 kw capacity which is designed for 8-hr charging of a 20-cell, lead-acid battery of up to 260 amp-hr capacity.

Nagle Pumps Inc. (3014) Perry Nagle. Nagle Pumps have given a lot of thought as to how miners can best solve the headaches associated with pumping corrosive and abrasive mixtures. Among the many types of pumps on display here will be the Type "T" horizontal shaft pump, Nagle inductor-primed, open type impeller for handling clear, corrosive liquids; closed impeller for abrasive mixtures.

National Malleable & Steel Castings Co. (830) H. H. Smith. Full-size assemblies of Willison Automatic Couplers and National Rubber Draft Gears will be on view here. Assemblies will demonstrate their wide application to four or eight-wheel mine cars, ranging from 4 to 30-ton capacities. Also included will be applications for side-dump, rotary-dump, drop-bottom cars, locomotives and other car types. Capitol Foundry Co., of Phoenix, National's subsidiary, will have a display, too.

The New York Air Brake Co. (327) Robert L. Firth. This firm is particularly proud of its comprehensive coverage of fluid power equipment, liquid handling pumps and vacuum pumps, for the metal and non-metallic mining industry.

Nordberg Manufacturing Co. (918) R. E. Schulz. Theme running through this exhibit will have the attractive title, "Engineered for Profitable Operation." It will point up the profit potential designed into Nordberg's line of mine hoists, Symons cone crushers, screens and grizzlies, grinding mills, gyratory crushers and diesel engines. Ask for information also on Nordberg's new fine reduction crusher, the Gyradisc.

Northwest Engineering Co. (414) A. G. Crowley. Northwest Engineering has photographs to do the talking for them. Displayed will be pictures of excavating and material handling equipment. Of course, Mr. Crowley will be there to give you full details on any item.

Ohio Brass Co. (2118) J. H. Sanford. Ohio Brass will be showing a complete display of overhead trolley wire fittings, aluminum and copper feeder cable fittings, rail bonds and collectors for locomotives, fused taps and rail clamps, expansion shells and plugs for roof bolting.

Oliver United Filters, Inc. (450) C. W. Crumb. A full-size unit 10-in. Centriclone holds the center of the stage here with scale models of the American Disc-type filter and the Oliver horizontal filter. Latest innovation at Oliver is the type "L" stainless steel centrifugal pump.

Pioneer Engineering Works, Inc. (337) W. A. Rundquist. Here you will be able to see a quarter-scale operating model of a complete crushing and screening plant featuring fully authentic reproductions of the Pioneer line of Oro manganese steel feeders, jaw crushers, triple roll crushers, vibrating screens and conveyors. No toy, this, it is an authentic operating model 1/64th the size of a full-scale plant.

Precision Radiaton Instruments Inc. (152) L. Norman. This booth will boast a complete line of geiger counters, drill hole counters and Scintillators. This firm claims that its Model 118 "Royal Scintillator" is the best instrument made for uranium prospecting.

Raybestos-Manhattan, Inc. (2009) A. L. Hawk and S. V. V. Hoffman. Manhattan Rubber Division will introduce the Poly-V Drive, its latest development, which it terms a "revolutionary" product. Poly-V Drive consists of a new-type belt with specially designed pulleys to mate with the ribs in the belt. The belt combines the simplicity of a flat belt and the grip of a V-belt. It eliminates matching, has greater strength, maintains constant pitch diameter, saves space and suffers less wear. In addition, display will include latest conveyor belt developments along with the company's general line.

Reich Bros. Mfg. Co. (347) Wendell Reich. You'll want to see Reich's Model 600H, heavy-duty truck mounted rotary blast hole drill, using compressed air for removal of cuttings. This machine was specifically designed for the mining industry.

Reliance Electric and Engineering Co. (239). Neatly packaged in the company's mobile display bus will be all it's wares from specific purpose ac and dc motors to adjustable speed drives and electronic regulators. Big feature for miners is the compact motor with the built-in starter.

John A. Roebling's Sons Corp. (608) Albert Neroni. This subsidiary of Colorado Fuel and Iron Corp. will show a comprehensive range of wire rope constructions and electrical wire and cable for mining. A colorful 20-ft display unit will serve as backdrop.

Sanford-Day Iron Works, Inc. (314) Wm. D. Moreman. Plastic model of latest model Granby-type mine car will illustrate high points of its design. There'll also be a working model of 1-2-3 drop-bottom car and various models of S&D ball bearing wheels.

Simplex Wire & Cable Co. (3009) E. J. MacKenzie. On display will be various kinds of insulated wires and cables including low and high voltage Tirex cord and cable, Anhydrex shaft cables for use up to 20,000v and low voltage Anhydrex.

Smith Engineering Works (509) H. H. Schaper. A special large scale cutaway, operating model of a Telesmith Gyrasphere crusher will let you see all the fine points of the company's product for yourself and should be an interesting visit for all engineers.

Southwestern Engineering Co. (926) Herbert V. Hughes. In addition to a specially constructed back-drop showing the company's many services in mining and metallurgy, the new 3-D screening action of the Sweco separator will be demonstrated with a 48-in. operating unit. And for the grateful weary . . . the Sweco coffee bar.

Stearns Magnetic Inc. (3015) William E. Barta. For an illustration of the method used to separate magnetic from non-magnetic materials in ores, ask to see Stearn's "R" Type Magnetic Separator. In the same booth will be an electro-magnetic pulley, a suspended cross-belt magnetic separator and cutaways of a magnetic clutch and brake.

CONTINUED ON P 230

FINANCIAL AID TO HIGHER EDUCATION

What Business Can Do to Help Our Colleges and Universities

Is the financial squeeze now gripping our colleges and universities grave enough to warrant direct action by the business community? If so, what can business do about it? This editorial is addressed to these two questions.

In the previous editorial in this series of two, it was demonstrated that **our colleges and universities, and particularly the independent institutions, face financial difficulties, which, unless relieved, promise to get progressively worse and might ultimately result in a national disaster.** This state of affairs obviously gives the business community a crucial stake in helping to relieve the plight of these institutions. For our business organizations can be no stronger than the total community of which they are a part.

It does not follow automatically, however, that every business firm should give direct financial aid to education. Already the business structure is heavily burdened with activities unrelated to its main purpose. These include acting as tax collector for more than $65 billion of federal, state and local taxes in the year 1953. There is a limit to the amount of such public enterprise that can be loaded on the business system.

Business Holds Key to Answer

If, however, the survival of a key part of our educational system depends on its having financial help from the business community, that help should be provided. And this is the situation of our independent privately endowed colleges and universities.

Of course, our tax-supported institutions of higher learning must also be kept strong, financially and otherwise. But they have recourse to public support not available to the independent institutions. Largely on this account, their present financial difficulties are much less acute than those of the independent colleges and universities.

These independent institutions have seen price inflation eat away much of the value of their endowments. Moreover, there is no prospect that these endowments can be sufficiently replenished by gifts from the wealthy people who provided them in earlier years. Progressive income and estate taxes have seen to that. Thus, they are faced not only with a peculiarly acute financial problem, but also one which cannot be solved except by tapping other sources of aid.

Tax Support No Solution

It is conceivable that the independent colleges and universities might solve their financial problem by seeking support from tax revenues. If they did this, however, they would lose their distinctive character as independent institutions, and our system of higher education would lose one of its major elements of strength. That is the existence in our educational system of both independently financed and tax-supported colleges and universities. Each has its special contribution to make to a well-balanced system of higher education.

Business is directly dependent upon higher education to staff its increasingly complex and exacting operations. A key part in this process is played by the small, independent liberal arts colleges which are the hardest hit financially of all our institutions of higher learning. "These," states the Council for Financial Aid to Education, recently formed by a group of business leaders, "have contributed a high proportion of the intellectual, scientific and religious, as well as business leadership of the nation. Their programs are devoted to the teaching of values, particularly the values of freedom. They are a vital bulwark to our system of free enterprise."

Means of Providing Help

There are many means by which business firms can extend help to our colleges and universities. The most obvious, of course, is to make outright grants of money either to individual institutions or to groups of institutions for such uses as the institutions think best. Another means of help, increasingly employed by business firms, is to establish scholarships to pay the full cost of college or university courses of study. Sometimes the scholarships are open for general competition, sometimes they are limited to employees and children of employees of the firm granting them. Not infrequently those winning the scholarships spend some part of their school vacations working in the companies granting the scholarships.

A number of companies have recently provided for what have come to be called "scholarships in reverse." These companies pay a flat sum to a college or university for every one of its graduates they employ. Financing of university research programs also offers a broad avenue for financial aid to our universities by business.

Need Two-Way Communication

Some business firms have well-developed programs for financial aid to education. But they are exceptional. For most companies the problems involved are new and strange. These companies were created with the basic purpose to make money, not to give it away. Successful philanthopic operations involve a whole set of problems with which they have very little experience. Not the least of these is how to make business a dependable source of financial aid to education, since business has no assurance that the profits of one year will not be losses the next.

Considerations such as these emphasize the wisdom of a recent Industry-College Conference on aid to higher education by business, in making the first of its ten conclusions that "better communication, by direct contact, is needed for each [industry and the colleges] to understand the problems of the other." At this juncture the creation of mutual understanding is much more important than the raising of some money and letting it go at that. The problem of aid to education by business has its immediate urgency, but there is also a long-range program to be developed on which business and the colleges and universities must pull together in the years ahead to find a satisfactory solution.

As stated at the outset, failure to find a satisfactory solution could result in a national disaster. This means that, **to give proper heed to their own future prosperity and the future welfare of the nation, business firms generally must go to work on the problem of financial aid to higher education. They must go to work first, to understand the problem; second, to establish two-way communication with our colleges and universities about it; and third, to develop a program which pays proper heed to the needs and capabilities of both business and higher education.**

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Donald C McGraw

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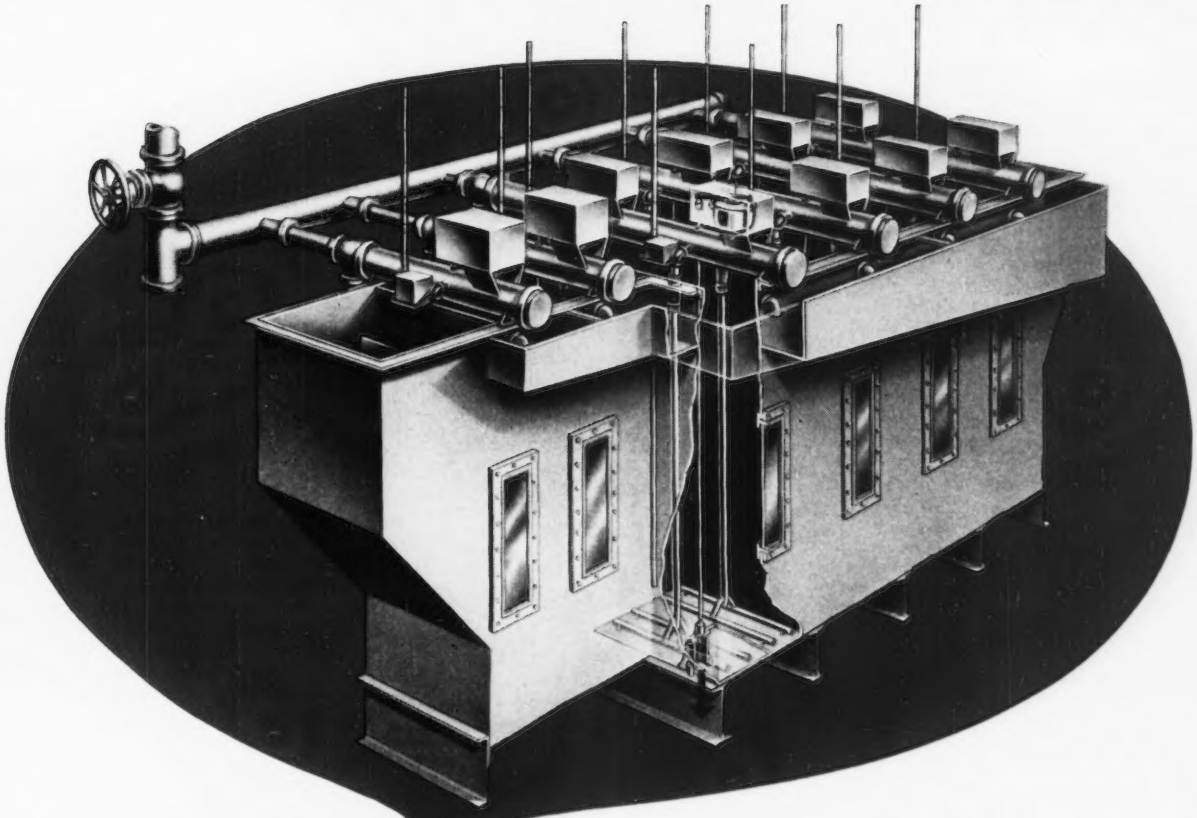

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FIFTY YEARS 1904-1954

WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

President Rejects Tariff Commission Recommendations: Increases Stockpile Acquisitions of Lead and Zinc

THE PRESIDENT'S REJECTION of lead-zinc tariff hikes surprised few people. When he postponed his decision on the Tariff Commission's recommendation in July, it was generally felt that he would eventually turn down increased rates. The rejection was officially announced one month later, on the very day Congress adjourned.

The action represented a triumph for the State Department, which had been bitterly tangling behind the scenes in the President's cabinet-level mineral policy committee with the Interior Department on the matter. Interior, supported by Commerce and Treasury, advocated more tariff protection for domestic miners.

State's position was that rate increases allowable under the Tariff Law weren't really high enough to keep out foreign metal, but would nonetheless be a slap in the face of Mexico, Canada, and other friendly countries. It recommended the use of stockpiling to support prices.

The President then ordered a new step-up in lead-zinc stockpile buying—over and above the program begun in June. He announced that "the Government is in a position where it could" buy up to 200,000 tons of lead and 300,000 tons of zinc by next July. This is probably about twice the stockpile acquisitions planned under the original policy, and would account for more than half current domestic production, it was indicated.

The President also took action to keep some foreign metal off the market. He set up a "supplemental" stockpile for which foreign lead and zinc will be acquired through barter of surplus farm goods. Previously, surplus farm goods were bartered only for metals and minerals on the strategic stockpile's "required" list.

Although the President emphasized that the new supplemental stockpile will be as inviolate as the regular stockpile, some mining observers here look at this as the weak spot in the new program. They're worried that this lead and zinc may some day be dumped on the market.

The President handed the Secretary of State a ticklish diplomatic assignment under program: To let it be known—subtly as possible—that accelerated stockpile buying is a domestic assistance program and that foreign producers "will not . . . to seek to take any unfair advantage of it." At presstime, State Department officials were trying to figure out how this is supposed to be accomplished.

FOA Aid Dwindling

The curtain is coming down on the Foreign Operations Administration's far-flung mining operations. Since 1948, FOA and its predecessor agencies, the Mutual Security Agency and the Economic Cooperation Administration, have spent millions of dollars—the exact figure is hard to come by—to increase mining production in "friendly nations."

This program has been an essential part of the foreign policy of both the Truman and Eisenhower Administration.

Here's how FOA describes its objective: "(1) To help alleviate shortages of strategic materials essential for efficient production and technological development in the U. S. and other areas of the Free World; (2) encourage alternate sources of supply for countries whose pre-World War II trade patterns with Soviet bloc countries have been disrupted; (3) contribute to balanced development of underdeveloped areas; (4) provide a base for future rapid expansion of alternate sources in event of another war, and (5) help stimulate private investment abroad."

But to most U. S. miners, the FOA-MSA-ECA program is a major cause for the mining industry's recession today and a continuing threat to the industry's future welfare. Sen. George Malone recently tagged it "an international WPA."

Malone has hastened the program's end. He pushed through an amendment to this year's $2.7-billion Foreign Aid Bill which bans the use of about $570,000 still on FOA books for foreign mine development loans.

Because of the complexity of the program administered by FOA and its predecessors, you can't really identify all funds spent to aid foreign mining. But in general there were four different projects, and briefly here's how they stack up:

• **Economic Aid Program.** This is the basic Marshall Plan under which grants are made to friendly nations for procurement of plant and equipment to shore up local economies. Only Spain, Greece, Turkey, Formosa, Korea and Yugoslavia are still getting significant aid of this type, some of which is likely to be used for mining.

FOA records show that $202-million has been granted to Great Britain, France, Italy, Belgium, Luxembourg, and other West European countries to buy "construction, mining, and conveying equipment;" $35.5-million to the Philippines, Thailand, and other Far Eastern countries; more than $53-million to Greece, Turkey, and other countries in the Near East, Africa, and South Asia. Not all this equipment actually went into mines, of course. But additional funds, not included here, were earmarked for procurement of chemicals, motor vehicles, and other material used in mine production.

• **Strategic Materials Program.** This included the direct purchase of over $116-million worth of industrial diamonds, bauxite, graphite, tantalite, beryl, and other stockpile materials, and the lending of more than $134-million for 39 mine projects. In December 1951 administration of this program was shifted to DMPA, then later to GSA.

The development loans are being repaid in shipments of metals and minerals to the U. S. stockpile. The money is used mostly for support projects like construction of roads, railways, power facilities and port facilities, rather than direct mine production.

These are some of the bigger projects: $29.6-million to Norway and Germany for aluminum; $22.7-million to Jamaica and Greece for bauxite; $21.2-million to French Morocco for lead and zinc; $14-million to Northern Rhodesia for copper and cobalt; $10.3-million to French Equatorial Africa for industrial diamonds and $4.7-million for copper, lead, and zinc; $3.7-million to New Caledonia for chrome; $2.2-million to Tanganyika for lead and copper.

• **Basic Materials Program.** This is a related program under which $28.2-million was lent for support projects. These loans will be repaid in money instead of minerals. Biggest recipients have been Southern Rhodesia, French West Africa, French Morocco, and British East Africa.

• **Technical Assistance Program.** Moneywise, this program is relatively a small one. Under its operation, U. S. experts are sent overseas to provide technical aid, foreign technicians come here to study U. S. mining techniques, and basic mineral surveys are made in underdeveloped areas.

Sample Projects: Four French mining engineers studied U. S. nonferrous mining operations here to be used in French African Colonies; aerial surveys were made in Angola and Mozambique; a large-scale mineral survey is being conducted in Brazil for development of manganese, magnesite, and phosphate deposits; a similar project is under way in Mexico.

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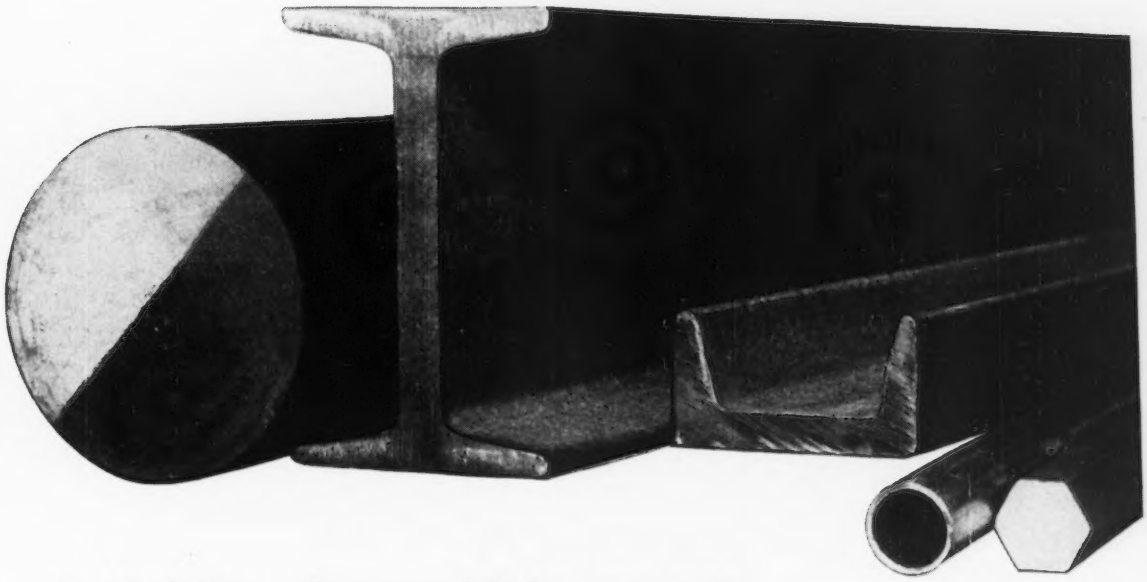

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USBM Reorganization

Interior Secretary McKay stirred up a new controversy last month when he released—and sweepingly okayed—a detailed report on USBM reorganization from a team of oil, coal, and metal industry advisers, headed by Curtis L. Wilson, Dean of the Missouri School of Mines. The fuss was almost as furious as the one raised last year when McKay removed the Civil Service classification for top USBM technical jobs.

The team's report proposed that USBM sell or lease its four helium plants to private firms, halt production of titanium and zirconium, halt oil shale experiments, keep synthetic liquid fuel tests on a small scale, and that a "major effort be directed to educational work" in the coal mine inspection program. In addition, the team recommended some administrative changes: abolishment of five of USBM's nine regional offices, decentralization of its control over research, and a streamlining in statistical activities.

The report became a quick target for political criticism about "another Administration giveaway." Both Republican and Democratic Congressmen were rankled by some of its details and McKay's hasty approval of them. For one, Congressional prerogatives were seemingly being by-passed. On the surface, it looked as if big things were in the works by USBM, yet the first most Congressmen knew about it was what they read in the papers. And first press reports were distorted.

Coal mine district Congressmen got scared that the Federal Coal Mine Inspection and Synthetic Liquid Fuel Research programs were being shelved. Westerners took the dim view that oil shale tests would be shunted aside and that Federal funds for helium would be cut off.

After a House Interior Committee hearing, hastily called a few days later, the furor was quelled. Undersecretary Tudor said Interior plans had been misinterpreted. Then he laid the facts on the line.

First, he revealed a quick switch in plans to dispose of the helium plants. Actually, Interior had been unable to find a private firm interested enough to make firm bids on the $15-million plants under existing conditions. In fact, Interior was later voted money to build a fifth plant in Oklahoma.

Tudor then asserted there was no intention to end Federal coal mine inspections, that oil shale tests would probably be continued with funds contributed by private firms, and that the titanium and zirconium proposals were really in line with standard USBM policy—to continue production only as long as private capacity is incapable of meeting defense needs for the two new metals. For titanium, this means output will end next month. Zirconium production, which goes to AEC, will continue indefinitely, however.

Most USBM officials were jolted by the report's recommendations on administrative changes. One of them claimed the proposals would double the Bureau's operating expenses.

LABOR THIS MONTH

Alan E. Adams, McGraw-Hill Washington News Bureau

NEW TAFT-HARTLEY RULES HIT UNIONS: The new Republican-led National Labor Relations Board has issued new directives for labor-management behavior. These will be felt all the way from the top-level collective bargaining table to the smallest plant level worker relations.

One decision probably will bring about a bargaining strategy switch by labor. The NLRB, reversing a four-year policy, now holds that unions cannot legally strike during the life of a contract, or until a wage re-opening date is written into the agreement. Previously, unions had been free to call a strike on 60 days notice while a contract is still in effect.

Ths new directive provides a written-in no strike clause—a clause unions have frequently agreed to in the past but as a selling point for other benefits. Now, management won't have to trade on the subject.

As a result of the Board action, labor organizations will be bargaining for shorter term contracts, or for wage re-openers in longer agreements. Bear in mind, this issue concerns only economic strikes; unions are still free to walk out over alleged unfair labor practices on the part of employers.

EMPLOYERS GAIN FREE-SPEECH FOOTHOLD: Another NLRB ruling opens the way for management to question its employees about union affiliation or activities. Previously any such interrogation had been banned as an unfair labor practice.

Now, employers are permitted to ask such questions provided they do not contain any implied benefits or reprisals for union organization. This qualification is important. The Board says it will consider the type of questioning and employers' sentiments towards unions in each case.

MINE-MILL STRIKE CRITICAL TO LEADERS: Mine-Mill and Smelter Worker officials had more at stake in the mining walkouts than winning a better wage offer. A long-term strike or a poor settlement from the union's viewpoint would leave Mine-Mill more susceptible to raids from outside unions.

The CIO's steel and auto unions are ready to pick up the pieces if Mine-Mill fails. These unions have repeatedly raided MMSW strongholds, but have lost out more often than not. A disgruntled Mine-Mill membership would make an invasion that much easier.

For this reason, MMSW leadership is extending the olive branch to both the AFL and CIO in hopes of working out a merger. The peace efforts are now confined to the local level and the hopes are that cooperation locally will swell to a merger at the top.

Joining either one of the major federations would swell Mine-Mill's war chest and provide a national sounding board for their programs. However, both the AFL and CIO are still unreceptive to the idea because of Mine-Mill's Communist tinge.

UNIONS CLAIM ANTI-RED VICTORIES: During the Congressional fight over legislation to control Communist-led unions, the major unions laid down a record claiming a successful house-cleaning in their own ranks.

The CIO Auto Workers reports the eleven Communist-dominated unions expelled from the CIO in 1949 have lost one-third of their membership since then.

While conceding that Mine-Mill—one of those expelled—has held its own in recent years, the auto union says its ranks have dropped by 20,000 to less than a 50,000 total.

The CIO and AFL believe these figures prove that labor is successfully tackling its own Communist menace and that the rest of the job should be left up to labor.

PAYS OFF MANY WAYS *around a mine!*

Here's one of the many jobs where a CAT* HT4 Shovel pays off around a mine. Equipped with an anglegrader, this unit is building a haul road for the U. S. Pumice Co., Leevining, Calif. Altitude—about 8000 feet. Engineered to stand up under difficult conditions, this rig takes the altitude and tough terrain in stride.

Around *any* mine, the Caterpillar HT4 Shovel itself is a mighty handy worker. You can keep it busy all day, day after day, on many different jobs—stripping, excavating, loading, grading, cleaning up, removing snow, back-filling, to name a few. What's more, on *any* job, you can count on it for *profitable* production. Its weight, horsepower and bucket capacity are *balanced* for maximum performance.

How rugged is the HT4? This will give you some idea. Its construction, in *every* detail, is *extra-strong*. For example, frame and mounting and lift arms are welded and cross-braced to prevent weaving and side sway. The bucket has a heat-treated, high-carbon steel cutting edge for longer wear and easy replacement. And the hydraulic system is enclosed, protected against dirt and grit. All these and other *important details* enable it to stay in there working with a minimum of down time!

Check over the number of different ways you can use the HT4 on your operation. Your Caterpillar Dealer, nearby for information and service, will be glad to show you what it can do for you on all these jobs. Just name the date—he'll demonstrate!

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PERSONAL NEWS

Typical of the modern ranch-type buildings which are being built by **Charles A. Steen** at Moab, Utah, as part of a $175,000 initial housing program, are the three above, shown under construction. Observing progress at the site are Mr. Steen and his mother, **Mrs. Roselie Shumaker,** treasurer of Utex Exploration Company, Inc.

K. S. Mittry of K. S. Mittry Construction Co., Fort Collins, has been elected president of Uranium Industries, Inc. of Grand Junction, Colo. The new company has been formed to carry out uranium and vanadium mining and holds claims on the Colorado Plateau.

Paul Juul heads the new industrial engineering department at Ray Mines division of Kennecott Copper at Ray and Hayden, Ariz.

Kenneth Schellinger, director of Cerro de Pasco Mining Co.'s research laboratory in Peru, has been appointed associate professor of metallurgy at Stanford's school of mineral sciences. Prof. Schellinger had been on leave of abscence from Stanford to USBM since 1951.

The Arrowhead Chapter of the Minnesota Society of Professional Engineers, at their semi-annual meeting held in Duluth July 16, installed the following officers: president, **Mauri E. Erkkila;** first vice president, **Leo H. Ebert;** second vice president, **Michael P. Walle;** secretary, **Lou M. Becker;** treasurer, **G. T. Beardshear;** and director, **L. L. McGladrey.**

H. W. Straley III, geologist and geophysicist of Princeton, W. Va., has completed a gravity investigation in southern Georgia.

C. Howard George was elected executive vice president of the New Jersey Zinc Co. and **L. S. Holstein** was named vice president.

J. Frank Sharp, former underground surveyor and later chief geologist at Consolidated Coppermines Corp., Kimberly, Nev., has taken over his new duties as superintendent of operations there.

Robert W. Hernlund, metallurgical engineer, was the first of eight specialists to go from Stanford University to Philippines University under an FOA contract between the two schools. Prof. Hernlund will be located in Manila for two years. Other teachers will leave for P. I. soon.

T. M. Carey and **A. Pearson** have been appointed engineering consultant and mine manager at Monia Tungsten-Tin Mining Co., N.L., in Tasmania.

R. B. Head has joined the titanium extraction research team, **F. L. Bett** will become research officer on the team, and **D. Borland** has been appointed senior demonstrator, all in the metallurgy department, University of Melbourne.

O. F. Fry has joined the staff of Mount Isa Mines, Ltd.

US Smelting Refining and Mining Co., at its directors' meeting in Boston recently announced the following changes: **George Mixter,** former executive vice president, retires, continuing as a director and member of the executive committee; **J. George Gange,** former vice president and comptroller, became assistant vice president; **Frank F. Benson** to comptroller; **James R. Sharkey,** assistant comptroller; and **Hollis G. Peacock,** assistant to the president.

Dr. Alberto F. Thompson, chief of technical information service, Atomic Energy Commission, will be one of the featured speakers at the joint convention of the New Mexico Mining Association and Southwest International Mining Association, to be held in Carlsbad, N. M., Oct. 14-16.

Frank G. Woodruff, formerly with iron mining operations in New Jersey and Michigan, has been appointed safety director of the Nevada mines division, Kennecott Copper Corp., at Ruth, Nev.

Morris F. LaCroix, president of Copper Range Mining Co., was the recipient of an honorary degree of Doctor of Engineering at the 66th commencement of the Michigan College of Mining and Technilogy.

OBITUARIES

Iver Jesperson, 35, pit foreman at the M. A. Hanna Carlz mine, died June 21 in Grand Rapids, Mich., after a short illness. He was a veteran of World War II.

Sir Herbert Gepp, 76, noted leader in Australian mining and one time general manager of Amalgamated Zinc (De-Bavay's) Ltd., died April 14 in Melbourne.

Hon. Welland S. Gammell, 43, minister of lands and forests, Ontario Provincial government, died suddenly of a heart attack at North Bay June 18.

Charles S. Davis, 77, chairman of the board and former president of Borg-Warner Corp., died July 2 in Paris, France, while on a European tour.

Charles Lively, superintendent of International Nickel's Levack mine, died suddenly on vacation in Nova Scotia.

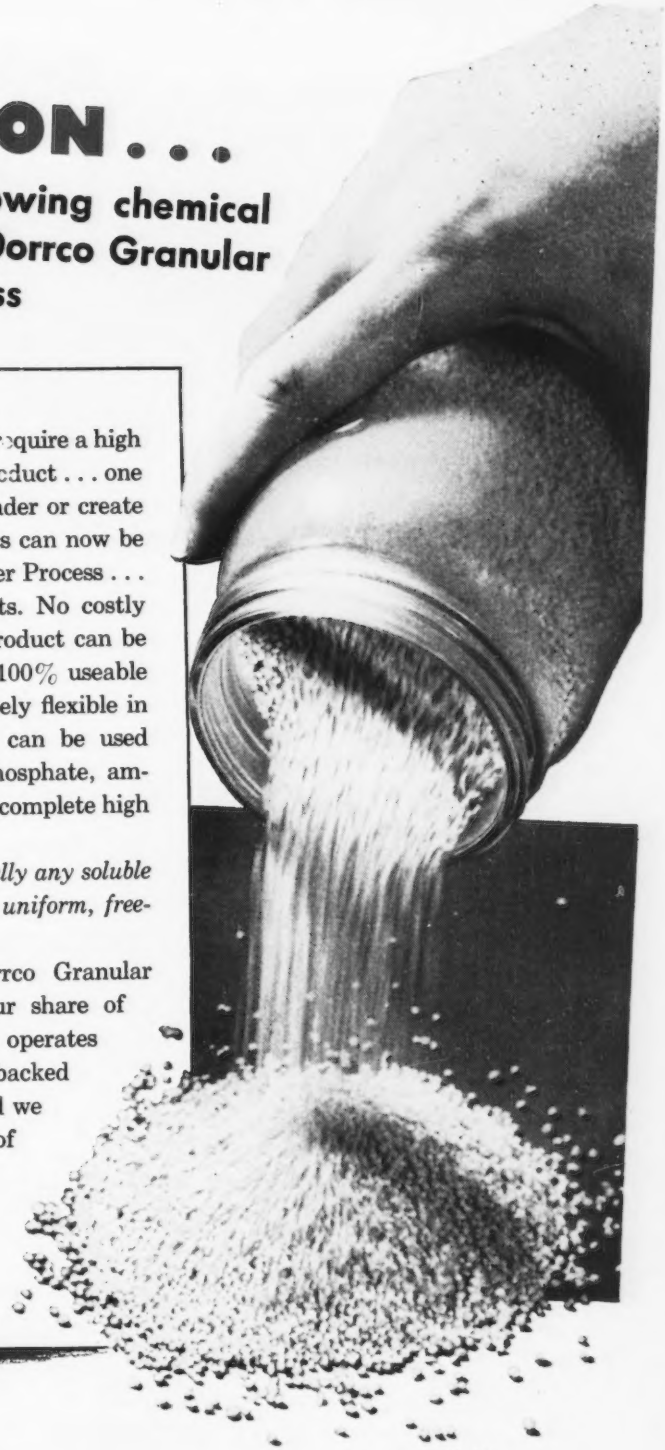
John A. Dresser, 89, consulting engineer and geologist for many mines and Canadian government departments, died in Montreal.

Paul Kruger, 70, former vice president of Anglo Lautaro Nitrate Co. and ex-member of the Nitrate and Iodine Sales Corp., died in Santiago. Mr. Kruger retired last year from active participation in the nitrate firms, but remained in Chile, where he had served for a great many years.

Harry A. Swem, 64, vice president and general manager in charge of sulphur operations for Texas Gulf Sulphur Co., died suddenly of a heart attack at Newgulf, Tex., on Aug. 8. His death occurred on the 35th anniversary of the date he joined the company and came as a great shock to his family and friends.

GRANULATION . . .

Key to the uniform, free-flowing chemical fertilizers produced by the Dorrco Granular Fertilizer Process



Successful sales in today's fertilizer market require a high analysis, uniform, free-flowing granular product . . . one that won't compact in storage, clog a spreader or create dust hazards. These valuable characteristics can now be obtained with the Dorrco Granular Fertilizer Process . . . applicable to both new and existing plants. No costly additives or fillers are required, and the product can be shipped direct to wholesaler or farmer in 100% useable form. What's more, the Process is completely flexible in meeting varying marketing demands. It can be used interchangeably to produce triple superphosphate, ammonium phosphates, ammonium sulfate or complete high analysis products.

In fact, the Process will granulate practically any soluble salt or mixture of salts so as to produce a uniform, free-flowing product.

There's a good chance that the Dorrco Granular Fertilizer Process will help increase your share of tomorrow's business. The Dorr Company operates a complete consulting engineering service backed by 35 years of experience in this field, and we will be glad to demonstrate the benefits of the Dorrco Granular Fertilizer Process in terms of your operation. Please address your inquiry to The Dorr Company, Stamford, Conn.

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Everything's Fun In San Francisco

HERE ARE THE EDITORS who compiled the facts on "Food And Fun In San Francisco," (see p 119). Obviously, they had fun doing it.

They are: Anne Lewis Simpson, administrative assistant to John Otterson, North Pacific Division manager for *Engineering and Mining Journal;* and George C. Tenney, president of McGraw-Hill Co. of California, and editor and publisher of *Electrical West.*

Mrs. Simpson is the grand-daughter of a '49er. She was born and raised in the San Joaquin Valley, and moved to the city (San Francisco of course) 11 years ago, after duty in the WAC. Of the places listed in our brochure, she prefers the Blue Fox, Alexis' Tangier, Sabella's, Piro's, and the Shadows. She has the common feminine desire to diet, but it is tough to do in San Francisco.

George Tenney came to San Francisco from Utah in 1904, survived the earthqu. . . pardon, fire in 1906, and has lived in the city since leaving the University of California in 1920. He fancies himself as something of a camp cook, a skill developed on hunting and fishing trips.

He doesn't see why anyone *should* diet in San Francisco.

George's favorite places are Grison's Steak House, Trader Vic's, Allouette, House of India, and Tarantino's. For lunch, George likes the Palace Palm Court; Mrs. Simpson prefers El Prado.

Which restaurant do you like? Why not let us know?

Letters (*Continued from p 4*)

71). It is high time someone came out with more of the truth about what has caused all the trouble with lead and zinc prices. All of the noise about cheap metals produced by slave labor in foreign countries (and) flooding the market is just whistling in the dark. Too many of the domestic producers think they should have the Government subsidize their horse-and-buggy methods rather than get their organizations on the ball and meet a little competition.

Now the Government is going to fix up the quicksilver producers. Let's hope they don't decide to listen to the used car dealers and scrap iron people (who have been pleading) that their business is being ruined and (that they) must have Government help.

ANGUISHED ZINC MINER

Silver Bell's Grinding

SIR:

We have read with great interest and pleasure your article on Silver Bell (*E&MJ,* July 1954, p 72) and. . . would like to make a correction with respect to the size of Akins screw classifier used. While in the description of the flowsheet (p 77) the Akins screw classifiers are indicated as 85-in., (they) are really 78-in. Duplex Type "s" units.

G. M. MEISEL, *Chief Engineer*
Colorado Iron Works Co.
Denver 2, Colo.

We Get Around

SIR:

We found ("How Dowa's Plant Extracts Copper—Zinc From a Single Electrolyte," January 1954 *E&MJ,* p 72) very interesting and we would be very grateful if you could put us in touch with the author. . . .We would like to obtain some additional information about this process and also about the Japanese wartime methods of separation of brass into constituents which he also mentioned.

W. ZYLINSKI, *Managing Director*
W. Z. Industries (Pty.) Ltd.
Johannesburg, South Africa.

New Books

Minerals for Atomic Energy. By Robert D. Nininger, deputy assistant director for exploration, Atomic Energy Commission. Publication of this outstanding book on prospecting is scheduled for Oct. 30, 1954. On the basis of a preview of its contents, here are some of the practical questions which this book will answer: What minerals will be needed for atomic energy programs? How do these minerals occur? Why look for minerals needed for atomic energy? Where should you look for them? How do you find them? How do you detect radioactivity? How should a discovery be evaluated? How do you market uranium, beryllium, thorium and other minerals related to the Atomic Energy Program? What is the value of uranium and other ores?

While learning the answers to the above questions, the reader will also receive the following: 1. a liberal, neatly-illustrated review of the major types of ore deposits; 2. a thorough knowledge of the mineralogy of atomic energy minerals; 3. a well-defined perspective of geologic provinces of the world and the importance of these provinces to the occurrence of atomic minerals; 4. much useful information on geophysical prospecting; 5. a good briefing on the marketing of selected minerals.

The appendix contains the following reference material: uranium non-ore minerals; thorium minerals; methods of mineral indentification; radioactive mineral identification; classification of mineral deposits; sample testing and analysis; sources of information and aid for prospectors; manufacturers of geiger counters; laws applying to prospecting in the U. S.; mining laws of the nine Western States; prices and markets in the United States; information on the United Kingdom and British Colonial Territories; sources of information outside of the U. S.

Mr. Nininger's forthcoming book on prospecting crystallizes an intimate knowledge of objectives of the U. S. Atomic Enegry Commission to encourage prospecting for selected vital minerals, and gives ample evidence of an exhaustive research effort to educate the would-be prospector in the fundamentals of geology, mineralogy, public land laws etc. necessary to pursue an intelligent search for ore.

Published by D. Van Nostrand Co. 250 Fourth Avenue, New York, N. Y. Pp 347. Price $7.50.

Mining Year Book, 1954. Compiled by Walter E. Skinner. Complete and up-to-date facts are included about 970 companies operating in all parts of the world, together with a list of names and addresses of 1150 mining engineers and mine managers and the companies with which they are connected. A buyer's guide to manufacturers of mining equipment containing 666 headings is also included. Published by Walter E. Skinner, 20 Copthall Ave., London E.C. 2. Price $7 postfree abroad, in England 30s. Od. net.

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X-RAY

the world's lightest surface diamond drill

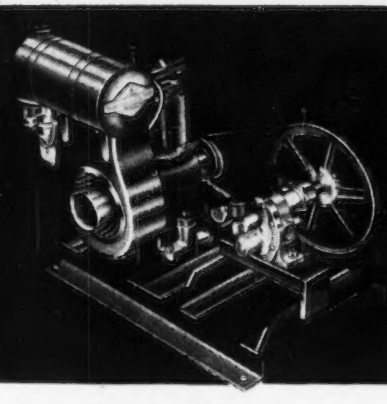
The featherweight X-RAY is absolutely unrivalled for preliminary exploration work in remote and difficult areas Developed for use in Canada's rugged North country, it measures only 29"x 23½"x 32½" Yet it gives you better than 200 feet of ¾" core and drills a 1-3/16" hole at any angle with two standard and five optional screw feeds

185 lbs. net weight!

Fully assembled with swivelhead and 3¾ h.p gasoline motor, X-RAY is an easy 2-man load For difficult terrain, it can quickly be broken down and reassembled (Weight with interchangeable 7 h.p. gasoline motor—213 lbs., weight with interchangeable compressed air motor —157 lbs.)

5½ hours per gallon!

X-RAY is the world's most economical drill—in first cost and in day-to-day operation. All parts are designed to withstand hard usage. Normal fuel consumption is less than 1½ gallons (imp.) per 8 hour shift. Full details from bulletin No. 161.



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Thomas M. Nevin Y Cia., S. A., Mexico, D.F • Larsen & Toubro (Pakistan) Ltd., Karachi, Pakistan.

MARKETS—Trends and Prices (*Continued from page 69*)

Copper Statistics—January-July 1954

Following is a summary of the Jan.-June copper statistics of Copper Institute, figures in short tons:

UNITED STATES

	Crude Production—Primary	Crude Production—Secondary	Refined Production	Deliveries to Fabricators	Stocks Refined at End
January	76,912	7,304	111,553	77,091	108,121
February	68,034	6,394	103,496	89,017	118,417
March	73,429	7,671	117,546	95,795	125,759
April	70,977	6,486	112,617	104,579	124,523
May	71,571	6,660	108,403	111,005	82,111
June	74,113	11,216	112,121	106,252	69,181
July	64,504	9,251	107,095	97,436	68,921

OUTSIDE UNITED STATES

	Crude Production—Primary	Crude Production—Secondary	Refined Production	Deliveries to Fabricators	Stocks Refined at End
January	114,652	531	85,100	91,941	280,510
February	109,041	702	70,864	74,457	275,375
March	123,441	583	93,824	93,235	279,804
April	124,846	176	87,747	99,193	273,070
May	118,099	262	95,564	115,197	255,234
June	124,503	266	88,615	130,323	180,651
July	132,139	358	105,762	105,216	170,558

Note: The statistics do not balance largely because of deliveries to the U.S. stockpile. Production of Cuba and the Philippines included under U.S.

Aluminum Production

By the fall of the current year it is expected that all new facilities will be in production. Total domestic primary capacity will then reach 1,540,000 tons annually. In 1950, U.S. production of primary aluminum was 718,622 tons.

Monthly production of primary aluminum in the U.S. for the years 1952, 1953, and the seven months ended July 1954, in tons, Bureau of Mines reports:

	1952	1953	1954
January	76,934	89,895	116,247
February	72,374	92,649	110,483
March	77,069	104,460	122,339
April	76,880	102,071	120,434
May	80,803	105,464	125,138
June	77,476	104,152	120,758
July	78,368	109,285	126,162
August	85,175	110,545	.....
September	76,882	109,333	.....
October	77,312	108,219	.....
November	74,639	105,636	.....
December	83,419	110,291	.....
Total, preliminary	937,331	1,252,000	.....
Final	937,330	1,252,013	.....

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted.

MISCELLANEOUS METALS

August 31, 1954

Aluminum ingot, 99 plus percent, lb.	22.2¢
Antimony, spot, lb., less than carload, in cases	31.97¢
In bulk, carload lots, f.o.b. Laredo	28.50¢
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$1.70
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb.	$2.60
Germanium, lb.	$295.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	60¢
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	27¢
Palladium, troy oz.	$21.00
Platinum (Official quotation wholesale lots) troy oz.	$84.00 @ $87.00
Quicksilver, flask of 76 lbs,. 25 flasks or more	$290 @ $293
Selenium, 99 plus percent, lb.	(b)$5.00 @ $6.00
Silicon, minimum 97 percent, carloads, lb	18¢
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 plus, grade A, lb.	$4.72

(a) Includes U. S. duty. (b) Depending on quantity.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$43.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:	
44% Cr_2O_3 no ratio	$21.00 @ $22.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $49.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$10.30
Mesabi bessemer	$10.05
Mesabi, non-bessemer	$9.90
Lead (Galena), 80 percent, Joplin, Mo., ton	$177.05
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties 88 @ 90¢ c.i.f. U. S. ports, duty extra. Long-term contract nominal at 80 @ 85¢, c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60¢
Columbium-Tantalum, per lb., combined oxides	$3.40
Tungsten Ore, per unit of WO_3:	
Foreign 60 percent, c.i.f. U. S. ports, duty extra	$23.50 @ $24.50
Domestic, scheelite, 60 percent f.o.b. mill	$63.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31¢
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$64.00

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½¢
Cobalt Oxide, 72½% to 73½%, ceramic grade, per lb.	$1.96 @ $1.97½
Copper Sulphate, 100 lb.	$10.35
Germanium Oxide, lb.	$142.00

ALLOYS

Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾¢
Ferromanganese, 74–76%, net ton, seaboard	$200
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent per lb. of contained Si	12.4¢
Ferrotungsten, 75 to 80 percent, lb. of W contained	$3.80
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, lb. per contracts	11.4¢
Spiegeleisen, per long ton, 19 @ 21% grade	$86.00

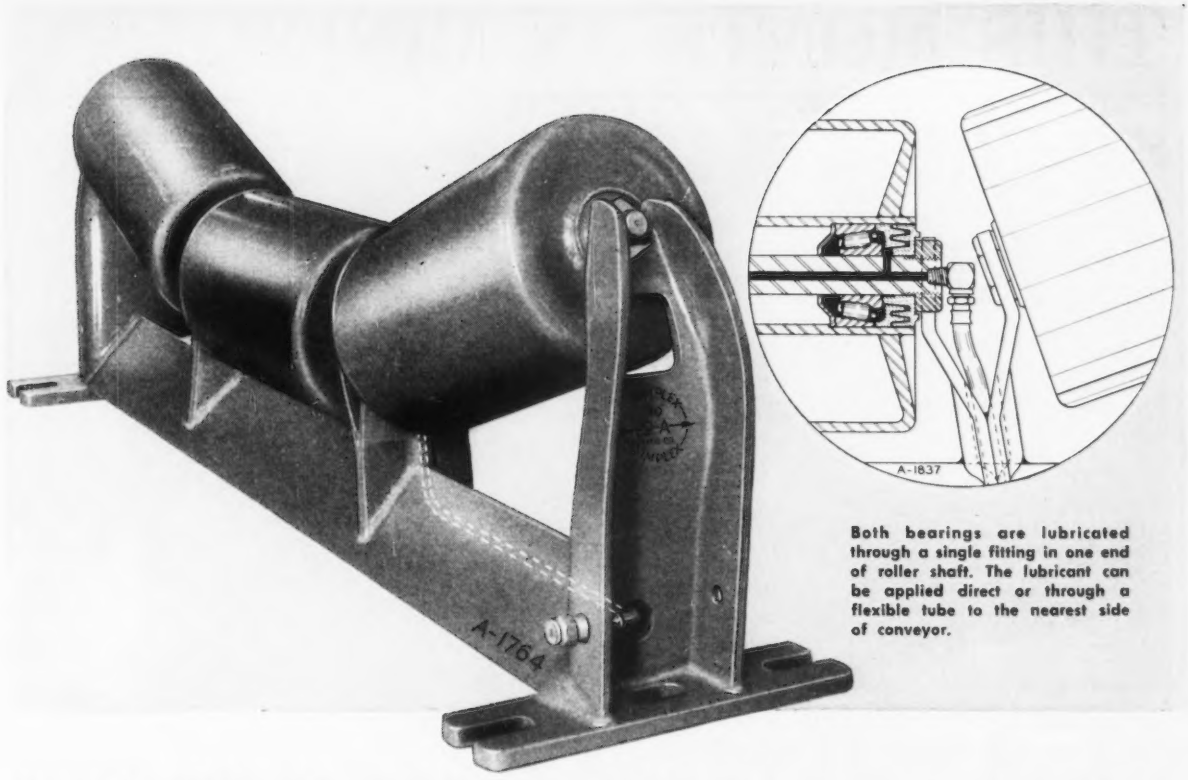
NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):	
Spinning fiber, 3-K	$460
Shingle fiber, 4-K	$185
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or Shorts	$34.00 @ $63.00
Barytes f.o.b. cars:	
Georgia, crude, per ton	$15.00
Missouri, 94 percent $BaSO_4$ per short ton	$13.25
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.05
Domestic, abrasive, 80 to 84 percent	(a)$18.00 @ $18.50
Feldspar, bulk ton.	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective, ton	$32.00 @ $33.00
60% effective CaF_2	$28.00 @ $29.00
Acid 97% concentrate, bulk, ton	$52.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$38.00
Mica—Domestic, f.o.b. mines. Punch 12 to 22¢. per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 70¢. to 85¢.; 2 x 2 inch, $1.10 to $160; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton Scrap $25 and up.	
Ocher, Georgia, ton, in sacks	$26.50 @ $30.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$25.50 @ $27.50
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$13.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Normal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces	$56.00
Steel f.o.b. Pittsburgh, billets, net ton	$64.00
Structural shapes, 100 lb.	$4.25



Both bearings are lubricated through a single fitting in one end of roller shaft. The lubricant can be applied direct or through a flexible tube to the nearest side of conveyor.

Look What's New in Belt Conveyor Carriers

Spun-end interchangeable rollers . . . ends recessed for close roller spacing . . . 3 shot lubrication . . . all steel frame, reinforced and jig-welded.

"SIMPLEX" Conveyor Belt Carriers, leaders for over 25 years, now include these new features that make them even stronger, better balanced and simpler than before.

SPUN-END, ONE PIECE ROLLERS

Each roller is spun from a single piece of heavy gauge steel tubing with inner bearing-tube welded to spun-ends. Ends are recessed to permit close roller-spacing for maximum belt support.

PARTS INTERCHANGEABLE

Roller assemblies and parts for all three rollers are interchangeable for quicker replacement and minimum stocking.

QUICKER, SAFER LUBRICATION

One shot lubrication for each roller from one or both sides of conveyor. No necessity for reaching under moving belt for center-roll lubrication.

LABYRINTH GREASE SEALS

Die cast non-corrosive labyrinth seals retain lubricant and protect bearings from dirt and moisture.

ALL-STEEL CONSTRUCTION

The one piece all-steel frame is flanged, reinforced and accurately jig-welded for great strength with minimum weight.

CARRIER IS SELF-CLEANING

Inverted angle cross-member and self-cleaning end-brackets prevent material from collecting and fouling rollers.

"SIMPLEX" 220 Series Carriers may be had for all conveyor belts from 18" to 60" wide with 5" or 6" rollers.

"SIMPLEX" Carriers are just one of many types in the complete S-A line. Whether your primary need is maximum years of service or relative low cost, there is an S-A Carrier to meet your requirements exactly.

Write today for Bulletin No. 453 on "SIMPLEX" Carriers or ask to have one of our engineers call — there is no obligation.

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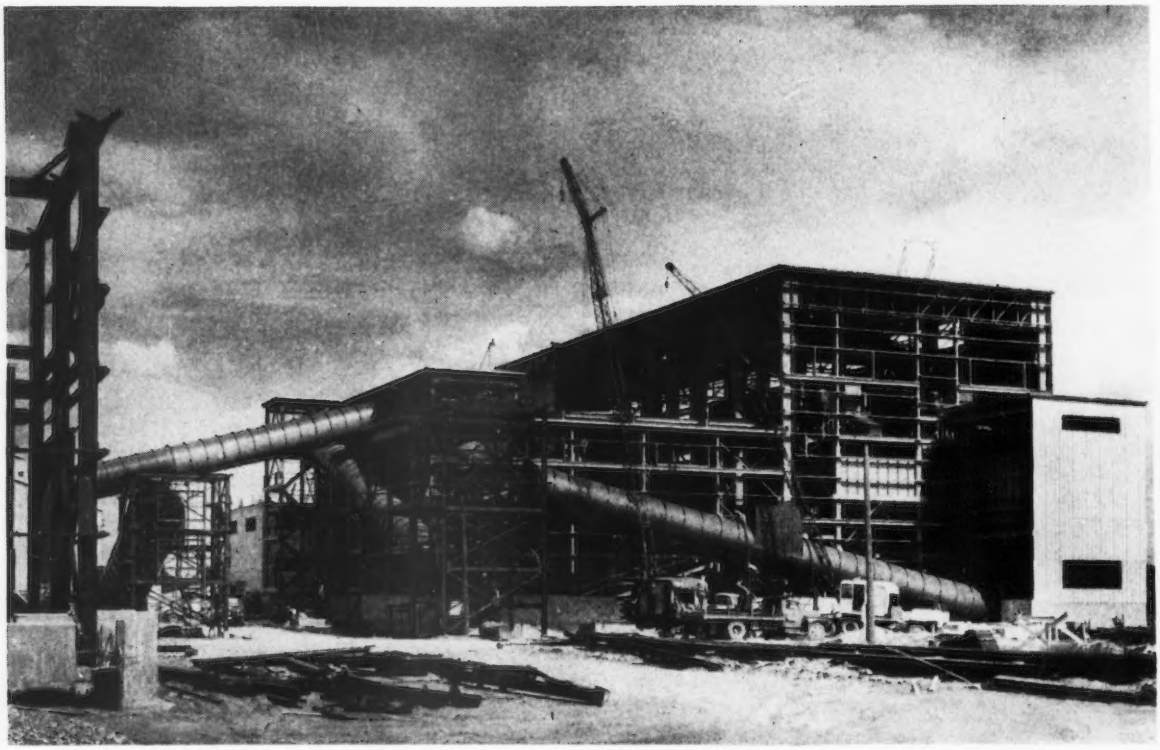
Specialists in the design and manufacture of all types of bulk materials conveying systems.

Standard Products Division
A complete line of conveyor accessories including centrifugal loaders—car pullers—bin level controls—etc.

Sealmaster Division
A complete line of industrial ball bearing units available in both standard and special housings.

SEE YOU AT THE METAL MINING SHOW — BOOTH 136

THIS MONTH IN MINING



NOW NEARLY FINISHED, Noranda Mines Ltd.'s new sulphur-iron plant is shown here when construction had reached a midway point. Note conveyor galleries. Plant was erected by Chemical Construction (Inter-American) Ltd., of Toronto.

Noranda's Elemental Sulphur Plant Slated to Begin Operation October 1

NORANDA MINES Ltd.'s $4.7-million plant at Port Robinson, Ontario, is scheduled to begin operation Oct. 1, using a new process for recovery of elemental sulphur, sulphur dioxide and iron sinter from pyrite.

Initially, plans call for the roasting of about 100,000 tons of pyrite a year. This pyrite is to be obtained as a by-product of Noranda's Horne Mine at Noranda, Que.

It is expected that about 18,000 tons of elemental sulphur, 36,000 tons of sulphur as sulphur dioxide and about 72,000 tons of iron sinter will flow annually from the treatment of about 300 tons of pyrite concentrate daily.

The new process was developed by Noranda in collaboration with the National Research Council of Canada in the early stages and, more recently, with the Battelle Memorial Institute, Columbus, Ohio.

Essentially, the new process is a method whereby most of the loosely-held atoms of sulphur are volatilized by roasting. Residue from the roasting will be sintered. Elemental sulphur will be recovered in the first step. Sulphur dioxide gas driven off in the second step will be used in an adjoining North American Cyanamid Ltd. plant for making sulphuric acid. Residue will be processed into high-grade iron oxide sinter.

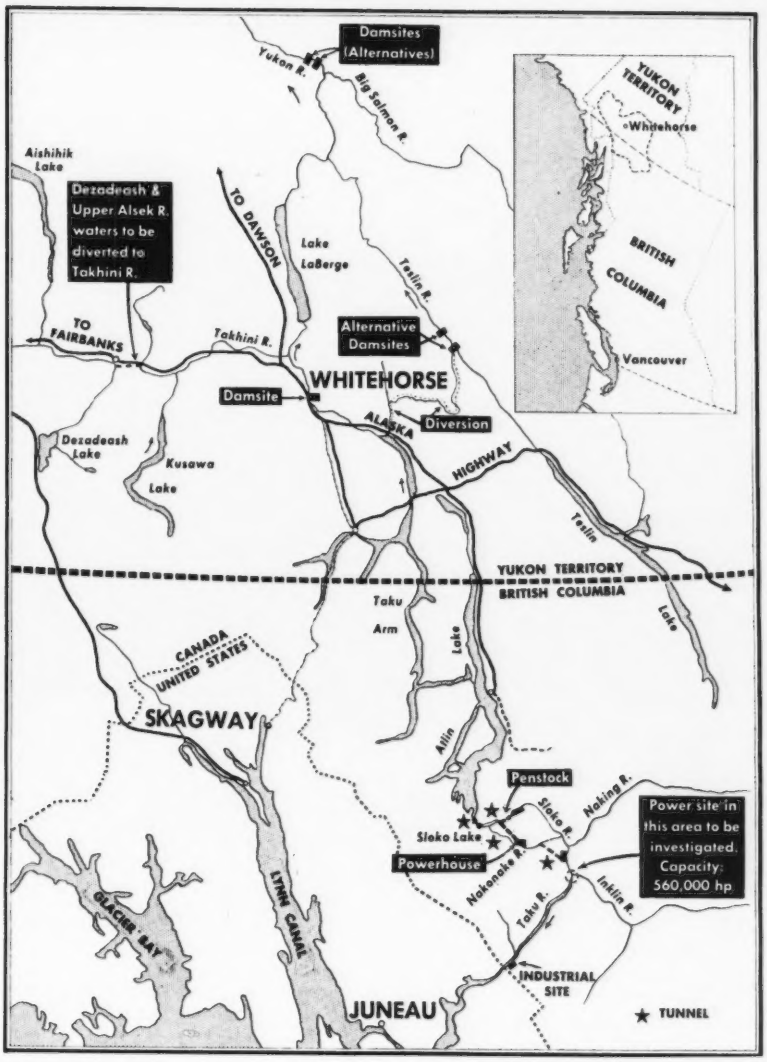
Eventually, feed for the new Port Robinson plant, near Welland, is expected to come from the former zinc-pyrite body of MacDonald Mines Ltd., now owned by West MacDonald Mines Ltd. This property, near the Horne Mine, has extensive proven reserves containing about 80% pyrite and low zinc values.

Noranda plans to erect a $5-million, 1500-ton mill at Noranda to treat the West MacDonald ore and subsequently to treat pyritic ore from the Horne Mine.

Also, a plant is being built at Noranda to convert pyrite concentrate into pellets for easier handling and processing.

The No. 5 orebody at the Horne Mine boasts an estimated 100-million tons of pyrite reserves, containing about 50% pyrite and low copper values. This is in addition to the by-product pyrite recovery from copper ore.

Furthermore, Noranda has blocked out large reserves of copper ore carrying pyrite at Gaspé Copper Mines Ltd., 62 mi west of the town of Gaspé. Here sufficient ore reserves, reportedly grading better than 1% copper, have been developed. Such reserves, it was estimated, would ensure continuous operation of the mine for about 35 yr at a rate of 6500 tons of ore a day (See p. 224).



PLANNED SITES of dams, tunnels, power generating plants, smelters and refiners.

Frobisher Granted B. C. Water License; $700-Million Northwest Project Outlined

BRITISH COLUMBIA officials last month approved an application from Frobisher Ltd. for a conditional water license which may eventually lead to construction of a $700-million B.C.-Yukon hydro-electric power and metallurgic development.

Formal application was made July 26 in Victoria when Premier W. A. C. Bennett and Resources Minister Robert Sommers met with Thayer Lindsley, head of Ventures Ltd.

B. C. officials said that a performance bond "running into millions of dollars" has been posted and added that this bond will be subject to annual review.

Slated for early construction are two small pilot plant production units in Vancouver, one for pig iron and steel, the other for cobalt-nickel.

Next year, construction is to begin on a $270-million segment of the vast project. This initial stage is to have a capacity of 660,000 kw. Planned potential for the completed project is 3,750,000 kw.

The development is to be undertaken by Northwest Power Industries Ltd., a subsidiary of Quebec Metallurgical Industries and Frobisher, Ltd., both of which are subsidiaries of Ventures Ltd., holding company for many Canadian mining firms.

Plans include an initial expenditure of about $212-million to divert the headwaters of the Yukon and Alsek Rivers (see map) by a series of dams and tunnels into the Taku River and an expenditure of $57-million for construction of smelting and processing plants at the head of Taku Inlet (see map at left).

Water storage is to be provided from three main dams, one 4 mi upstream from Whitehorse, a second on the Teslin River, 40 mi north of Teslin Lake, and the third just below the junction of the Yukon and Big Salmon Rivers.

Two tunnels, the first 1 mi long connecting Atlin Lake with Sloko Lake to the south, and the second 9.7 mi long to connect Sloko Lake to Nakonake River, are to convey water from Atlin Lake elevation 2192 ft to the Nakonake river, creating a drop of 1092 ft and a potential of 1,950,000 kw.

Later, a third tunnel is to connect the Nakonake Valley and the Taku River valley to generate 1,125,000 kw, bringing the total to 3,225,000 kw. Power stations are to be in the Sloko, Nakonake and Taku valleys, and these, with the further possible establishment of a dam on the Taku river itself, are to bring the total potential to 3,750,000 kw.

A 45-mi transmission line is to convey power from the initial project to the industrial site at the head of Taku Inlet. At first emphasis is to be on production of nickel, cobalt, iron, steel and manganese alloys.

Metallurgical objectives are four: treatment of cobalt-nickel ores and concentrates from New Caledonia, the Philippines and other Pacific islands; smelting of Pacific coast iron ores and concentrates for production of pig iron and steel; production of ferromanganese from ores from southwest Africa, and treatment of zinc concentrates and other base metal concentrates available in British Columbia.

Initial operations at the Taku Inlet call for daily treatment of 5500 tons of cobalt-nickel ore, daily production of 550 tons of iron and steel from B. C. ores, and 450 tons of manganese alloys.

Final development of the entire reservoirs in the area, the company states, will take many years to achieve.

The pilot plant production units in the Vancouver, B. C. area are expected to be in operation by 1957. Estimated annual output is as follows:

Cobalt (Million lbs)	Nickel (Million lbs)
1957 1,520	1,980
1960 2,720	51,680
1962 3,720	80,480
Iron and Steel (tons)	**Maganese Alloy (tons)**
1957 122,500	32,000
1960 122,500	32,000
1962 210,000	160,000

By 1962 the company expects to be producing 550 tons of iron and steel daily by electrolytic smelting.

A report from Victoria, British Columbia states that the Aluminum Company of America is apparently still in the picture with regard to hydroelectric development in the northern area of the province.

Also, Reynolds Metals Co., a leading United States aluminum producer, may take part in the overall project. Louis Reynolds, aluminum firm vice president, said that the matter is under study.

PHELPS DODGE's Lavender Pit is the largest open pit copper project to come into production since World War II.

Lavender Pit Operation Epitomizes Efficiency

EFFICIENCY OF OPERATION is reflected in the details of the working of Phelps Dodge Corp.'s Lavender Pit in the Warren Mining District of Arizona.

Under the guiding hand of Charles R. Kuzell, general manager of Phelps Dodge Corp., the operation has been underway since formal dedication ceremonies Aug. 7 (*E&MJ*, August 1954, p 126).

The Lavender Pit embraces an area of 155 acres and will be mined from sixteen 50-ft benches extending to the 4500 ft elevation, or 1005 ft below the highest original ground contour. Preliminary work began in January 1950 and included: removal of 250 residences, 20 business houses, relocation of U.S.Highway 80 and all utility lines, abandonment of the Southern Pacific railroad between Lowell and Bisbee, and the stripping of 46-million tons of overburden. During the life of the pit about 2-⅓ tons of waste will be mined to recover one ton of ore.

The 50 benches are mined by rotary drilling a series of 7-⅜-in. holes about 60-ft in depth, spaced at 14-ft intervals, and 15-ft from the edge of the bank. The holes are loaded with approximately 450 lb of explosives per hole and shot simultaneously. About 2100 tons of material is broken for each hole blasted in the series. The broken material is loaded into 25-ton Diesel trucks by electric shovels equipped with 6-cu yd dippers. Ore is delivered to the coarse crushing plant located on the 5050 bench and the waste is delivered to a transfer dock where it is dumped into 43-cu yd side-dump railroad cars and transported to the waste dump by a 1200 hp Diesel electric locomotive. The major equipment in the pit includes five 6-cu yd electric shovels, twenty-seven 25-ton Diesel trucks, twenty-four 43-cu yd side-dump railroad cars, two 1200-hp Diesel electric locomotives, three rotary and 11 churn drills and 7 bulldozers.

New Plants Described

The newly-constructed crushing plant and concentrator are briefly described as follows:

Broken ore is delivered by truck to the coarse crusher on the 5050 pit bench and is dumped on grizzlies with 6-in. openings. The oversize is passed through a 48-in. gyratory crusher and reduced to minus-6 in. The undersize and the crusher product are moved by two pan conveyors to No. 1 belt conveyor that delivers the products to a storage bin. This belt is a 48-in. endless belt, 2034 ft in length, driven by three 150 hp motors at a speed of 400 fpm to deliver 1500 tons of crushed ore per hour. The belt passes through a tunnel to the edge of the pit and over U. S. Highway 80 for a total inclined distance of 975 ft with a rise of 219 ft to the coarse ore bin having a capacity of 8000 tons. The coarse ore bin serves to even out the flow to the concentrator. From the bottom of the storage bin two 48-in. variable speed pan conveyors move the 6-in. product to a 42-in. belt conveyor for delivery to the fine crushing plant at the new mill.

The fine crushing plant consists of two banks with a 7-ft standard cone crusher above two 7-ft shortheads with 4 ft x 8 ft x ½-in. screens between the upper and lower cone crushers. The final product from this plant is minus-½ in. in size and is conveyed to an 8000 ton steel storage bin located above and behind the ball mill floor.

In the primary grinding section there are eight 10 ft x 10 ft ball mills driven by 800 hp motors. Each mill discharges into two duplex spiral classifiers. The ground product will average about 70% through 200 mesh.

The rougher flotation units on the floor below the classifiers have two identical sections, each of which serve four primary ball mills. Each section consists of six sets of 66-in. flotation cells with nine cells to a set. The product from the first three cells is sent to cleaner cells on the floor below and from the last six cells to the regrind section. Tailings from these cells are sent to two 300-ft thickeners. The thickened tailings are delivered by gravity to the disposal ponds through 17,000 feet of 18-in. transite pipe.

The cleaner flotation units have two identical sections serving the two rougher flotation sections on the floor above. Each sections consists of six sets of 66-in. cells with three cells to a set. The finished concentrate from these cells is delivered

(Continued on p 232)

Federal Physicians Studying Health Hazards Faced by Uranium Miners on Colorado Plateau

HEALTH HAZARDS faced by uranium miners are being studied by United States Public Health Service physicians and technicians now touring the Colorado Plateau in "research caravans".

A total of 1000 uranium miners and mill workers already have been examined in the first phases of the program, but with the number of miners in uranium production doubling every 18 months, the examination of every miner is sought by the USPHS.

Caravans, utilizing trailers, are equipped to give urine, blood and chest X-ray examinations. Eighteen field clinics are scheduled in 20 mining districts of Utah, Colorado, New Mexico and Arizona during the remainder of the summer, according to Duncan Holaday, USPHS Occupational Health Field Station, Salt Lake City, coordinator of the program. Dr. James Egan is physician-in-charge.

Cooperating agencies are the AEC and the state health departments of the four states.

Noting that major mining and milling companies are cooperating fully, Holaday said:

"We are not seeking to run anyone out of the industry. The hazards are controllable, and furthermore it takes years of exposure to radioactive materials to cause damage to human organisms."

An interim report covering certain phases of the studies into health hazards faced by uranium miners and mill workers has disclosed no clear-cut pattern of illness, according to Holaday. Analysis of medical histories taken since 1950 show a predominance of respiratory infections and some eye inflammations, but no significant changes in blood or urine. However, workers in one vanadium-uranium processing plant were reported to have shown a green coating of tongue and teeth.

E. Elbridge Morrill, Jr., director of the Utah State Health Department Occupational Office at Salt Lake City, cooperating with the USPHS survey work, this month listed hazards to uranium miners as including radon gas and its decay products, silica dust, gamma radiation, gases resulting from blasting, and oxides of nitrogen resulting from use of diesel motors underground.

The Utah office is cautioning uranium miners and employing firms to follow all standard safety practices of the underground mining industry, plus sensible precautions as regards possible radiation.

Miners are being urged to take daily baths, preferably showers, and to wash clothing frequently to minimize skin contact with radioactive dust. Employment of "wet" mining practices is recommended to combat silicosis, while rapid and efficient removal of contaminated air from mines is likewise recommended to cut hazards.

Fully 70% of the region's known uranium miners are responding to invitations to take field clinic examinations, the USPHS reported.

According to Mr. Holaday, research thus far indicates hazards are not excessive, with less danger apparent from radon (radioactive gases) than from dust inhalation. Prevention of silicosis along with guards against radiation damage is especially necessary, the USPHS believes.

AEC Ore-Buying Station Opened at White Canyon

A URANIUM ORE-BUYING STATION was opened in August by AEC in the White Canyon area of southeastern Utah.

Ore produced by mines in this area had been purchased by the Commission at Monticello, Utah; these ores now are being purchased at the White Canyon station.

In addition to standard automatic sampling facilities, equipment at the new station includes primary and secondary jaw crushers, a set of rolls, and a third crushing unit plus a sample grinder and pulverizer.

The station is being operated for AEC by American Smelting & Refining Co. It will purchase copper-uranium ores, carnotite-roscoelite ores, and other ores produced in the area, tributary to the new sampler.

ATOMIC ENERGY COMMISSION last month released the listing of the top 20 uranium ore producers in the United States, all of whom are operating on the Colorado Plateau.

Some producers ship from just one mine; others from several mines. The AEC's top 20 are:

Vanadium Corporation of America
U. S. Vanadium Co.
Climax Uranium Co.
Consolidated Uranium Mines, Inc.
Utex Exploration Co.
Haystack Mountain Mining and Development Co.
Garwood & Gerlach
Dulaney Mining Co.
La Salle Mining Co.
Navajo Uranium Co.
Anaconda Copper Mining Co.
Walter Duncan
G. W. Williams
Vernon Pick
Frank Nacheenbetah
Arrowhead Uranium Co.
Bunker & Co.
Cooper & Bronson
Homestake Mining Co.
E & M Mining Co.

News Highlights

Satisfactory progress is reported in development of copper orebodies at Granduc Mines Ltd. property in the Alaska Panhandle. **Page 148.**

Old Reliable, historic copper mine near Tucson is in production again, 35 year after being abandoned. **Page 152.**

The new price guarantee isn't likely to step up quicksilver production in California, some operators say. **Page 155.**

Development work at the Vulcan-Galena project on Idaho's Lake Gulch has extended the main shaft from the 3000 to the 3400 level. **Page 159.**

Depressed lead-zinc prices are forcing more and more Coeur d'Alene companies to turn their attention to uranium. **Page 160.**

An end of the Iron Country's 1954 shipping season is possible by mid-November. **Page 164.**

Golden Anchor Mining & Milling Co. is installing a new crushing and grinding unit at its operation at Treasure Mountain, near Helena, Mont. **Page 168.**

Nearly 200,000 acres of Acoma Pueblo tribal lands in New Mexico soon may be opened to uranium exploration. **Page 172.**

Harvey Aluminum Co. has developed processes for treating Salem bauxite at its experimental plant at Salem, Ore. **Page 175.**

First uranium mine in the eastern United States has begun operation in Pennsylvania. **Page 176.**

Quebec Asbestos Corp. reportedly has discovered a new major orebody near Thetford Mines. **Page 182.**

A new concentration plant is in operation at Pasto Bueno Mine in Peru, said to contain one of the world's richest known tungsten deposits. **Page 200.**

Concrete towers are replacing latticework headgears at several new goldfields in South Africa. **Page 203.**

Shaft sinkers at Merriespruit Gold Mine in the Orange Free State are claiming a world record. **Page 204.**

An inexpensive process for separating impurities from beach sands reportedly has been developed in Australia. **Page 206.**

Negotiations reportedly have reached a conclusive state for Swedish exploitation of 14 copper ore fields in Norway. **Page 214.**

A process for extracting 85% of uranium contained in poor host-minerals reportedly has been developed in Japan. **Page 220.**

Last-minute conferences averted a threatened shutdown last month of all Sicilian sulphur mines. **Page 226.**

Northern Rhodesian Labor Negotiations End; African Advancement Issue Creates Impasse

NORTHERN RHODESIAN copper mining companies announced "with regret that the negotiations regarding African advancement in the copper mining industry of Northern Rhodesia have ended inconclusively."

The four companies concerned are Mufulira Copper Mines Ltd., Nchanga Consolidated Copper Mines Ltd., Rhokana Corp., Ltd., and Roan Antelope Copper Mines Ltd.

Negotiations began more than a year ago when the companies asked the Northern Rhodesian Mine Workers Union, an organization of European workers, to enter into informal discussions with the companies "with the view to ascertaining whether a practicable scheme for African advancement in the industry could be jointly evolved which would both have regard to the interests of the members of the European Union and at the same time provide some agreed concession to the aspirations of African employees."

The union of European workers has held to the position that African workers are to be employed at jobs "within the field of the European daily paid workers" only if they get equal pay and all the conditions of service given the European. It has more recently added the provision that the advancement of an African must be to a complete job held by a European and that no subdivision of jobs should be permitted. The African representatives, the companies report, "have made it clear . . . that they regard this attitude as effectively maintaining the bar to their future progress."

African representatives have agreed with the companies' position that some simplification and subdivision of European jobs is essential if the advancement of Africans is to be effective, both in order to provide opportunities of training and also to bring work and responsibility within the present capacity of African workers. This would involve special rates of pay.

Pay rates, bonus and other conditions of service of the European workers are based on those originally required to attract European labor in the days when conditions were primitive and unhealthy. These pay rates have been rising.

Report states that the pay rates and conditions of service of the African workers compare most favorably with those elsewhere in Southern Africa and are constantly improving.

Companies believe that the diminution of the gap between European and African pay-rates must be related to an improvement first in the productivity and thereafter in the standard of living of the African community.

The companies gave assurances that no European worker would lose employment as the result of African advancement. The companies also offered to create a substantial number of intermediate posts for the Africans in order to train them, company officials say.

"In the absence of agreement between the four parties directly concerned" they reported, the companies "recognize the need for Government intervention and are prepared to cooperate fully with the Board of Inquiry which the Northern Rhodesia Government intends to set up forthwith."

Nickel Powder Output

SHERRITT GORDON MINES Ltd. announced in mid-August that its new Fort Saskatchewan, Alberta, refinery is producing pure nickel powder and by-product ammonium sulphate in commercial quantities. The plant, first of its kind, uses a high-pressure ammonia-leaching process for extracting metal from complex ores. It began production July 22.

Zirconium Research

RESEARCH TO DEVELOP a less-costly method of producing ductile zirconium is to receive increasing attention from the Bureau of Mines, it was announced last month. Zirconium is particularly useful in building hot atomic ovens, it was explained.

Fairless Award

AMERICAN INSTITUTE of Mining & Metallurgical Engineers has announced acceptance of a fund from U. S. Steel Corp. for establishment of an annual Benjamin F. Fairless Award to recognize distinguished achievement in iron and steel production and metallurgy. First award will be made at the AIME annual banquet in Chicago next February.

Mining Calendar

AIME Industrial Minerals Division, Fall Meeting, Oct. 5-9, Whiteface Inn, Lake Placid, N. Y.

New Mexico Mining Association and Southwestern International Mining Association, Annual Meeting, Oct. 14-16, Carlsbad, N. M.

Rocky Mountain Region Industrial Minerals Conference, Oct. 28-30, Newhouse Hotel, Salt Lake City.

Society of Exploration Geophysicists, 8th Annual Midwestern Meeting, Nov. 18-19, Adolphus Hotel, Dallas.

Colorado Mining Association, Annual Meeting, Feb. 3-5, Denver.

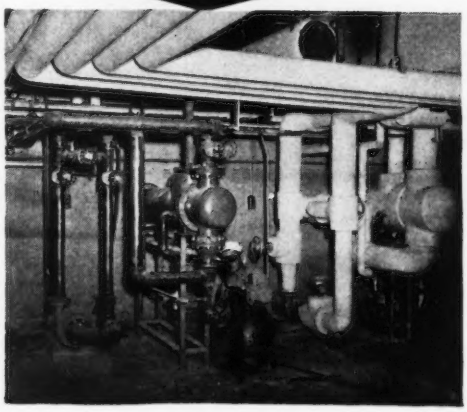
Ninth Western Metal Congress & Exposition, Mar. 28-April 1, Pan-Pacific Auditorium, Los Angeles.

WALWORTH VALVES on the job in the mining industry

The permanently leakproof quality of a Walseal joint was a deciding factor in the selection of these Walseal *bronze* valves and fittings for installation in the administration building of a western electrolytic copper refinery*. Shown here are heat exchangers and hot water recirculating lines. The piping system made with Walseal joints is actually a one-piece pipeline. Walseal joints can be made only with Walseal Valves and Fittings.

Walseal, a registered trademark of the Walworth Company, identifies Walworth Valves and Fittings having factory-inserted rings of silver-brazing alloy in threadless ports. For descriptive literature, see your nearby Walworth Distributor, or, write: Walworth Company, General Offices, 60 East 42nd Street, New York 17, New York.

*Name on request



WALWORTH

WALSEAL® VALVES AND FITTINGS

Cutaway view of a Walseal Tee showing: factory-inserted ring of silver brazing alloy; fillet of silver brazing alloy that appears upon completion of Walseal joint; cutaway view of the completed joint showing that silver brazing alloy has flowed in both directions from the factory-inserted ring.

Better because . . . **There's no guesswork when a silver-brazed joint is made with a Walseal fitting. Sil-Fos alloy, which appears as a fillet at the face of a Walseal joint, comes from rings which have been factory-inserted in the end connections of Walseal fittings. The bright silver alloy fillet that you can see assures full penetration of alloy for a permanently leakproof joint.**

Walseal is a registered trade mark which identifies valves and fittings manufactured by the Walworth Company. Walseal products have factory-inserted rings of silver brazing alloy in threadless ports. Walseal joints can be made only with Walseal valves and fittings.

If you're piping water, oil, steam, air, oxygen, nitrogen, helium or other industrial gases or refrigerants through brass, copper, or copper-nickel pipe, you'll want to investigate Walseal — available in complete lines of valves and fittings in four distinct pressure ranges — from 0 to 5000 psi. working pressure*. Your copy of Circular 115 will be sent on request . . . see your near-by Walworth Distributor today, or write to: Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.

*Walseal fittings and valves are being used at sub-zero temperatures as low as —350 F.

Make it "a one-piece pipeline" with WALSEAL

SEE OUR CATALOG IN SWEET'S

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

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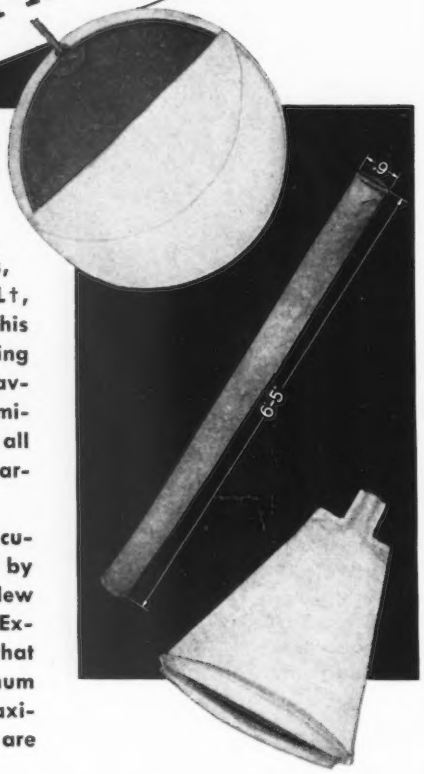
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

- Vacuum and Pressure Filter Element Covers
- Dust Collector Tubes, Bags and Envelopes
- Anode Bags

Let US make up your Element Coverings from NFM Filter Media



NFM Filter Media are woven from Nylon, ORLON*, VINYON N**, Saran, Glass, Dynel, Cotton, VINCELt, DACRONtt, and TEFLON***. This wide range insures your obtaining the type of element covering having the greatest degree of chemical resistance and best general all round performance for your particular operation.

NFM element coverings are accurately and durably fabricated by skilled personnel at both our New Haven and Salt Lake plants. Experience has demonstrated that filter cloth costs are at a minimum and filter performance at a maximum wherever NFM products are employed.

If you are not absolutely certain as to which type of synthetic or natural fiber is best for your use, send us a complete description of your operating conditions and we'll be glad to make a recommendation. Our many years of experience mean that we have quite a fund of knowledge at your disposal.

* TM for Du Pont acrylic fiber
** TM—Union Carbide & Chemical Co.
*** TM for Du Pont Tetrafluorethylene Fiber
† TM—NFM Reg. U.S. Pat. Off.
†† TM for Du Pont Polyester Fiber

Weavers of Industrial Filter Media for over Forty Years

NFM The National Filter Media Corp.

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IN THE U. S.

ALABAMA

S.S. Ore-Chief, first of the big boats used in transporting iron ore from Puerto Ordaz, Venezuela, arrived Aug. 9 at the Mobile Ore Terminal of the Tennessee Coal & Iron Division of United States Steel Corp.

Thus began the normal functioning of the giant new terminal and its unloading facilities, after weeks of trial with boats of smaller tonnage.

Dravo Corp. of Pittsburgh installed trolley-type ore unloader facilities used to transfer ore from ocean-going boats to railroad cars and barges for shipment to TCI furnaces or to the storage area at the terminal.

Ore imported through the new terminal contains up to 60% iron. This is blended in Birmingham with lower-grade local ores, maximum iron content of which runs to 36%.

Puerto Ordaz is the Venezuelan shipping port from which Orinoco Mining Co., U. S. Steel subsidiary, began first shipments last January of Cerro Bolivar ore (*E&MJ*, December 1953, p 92).

ALASKA

Satisfactory progress is reported in development of copper orebodies at the Granduc Mines Ltd. property near the southern end of the Alaska Panhandle.

L. T. Postle, general manager of Granby Consolidated, the parent firm, stated that the west orebody has been traced for a length of 970 ft with an average width of 27.8 ft and a copper content of 2.03%.

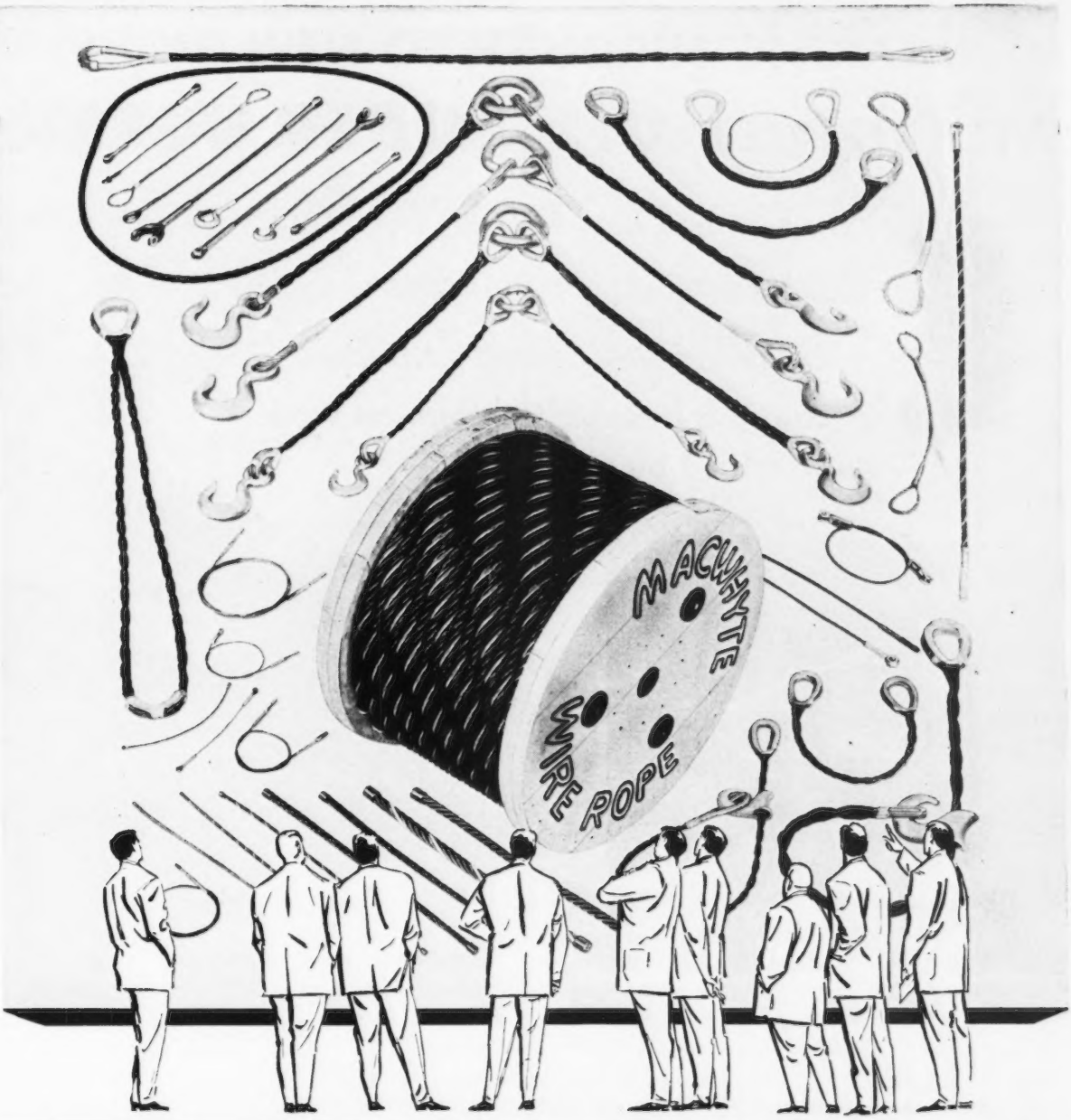
He added that the east orebody has been traced for 900 ft along the strike with an average width of 104 ft with a copper content of 1.77%. During June, 351 ft of drift was driven and 2244 ft of diamond drilling completed.

Big Hurrah gold lode mine last month was preparing to start production. Operators have applied for their certification for Territorial tax exemption given to new producers for the first 3½ yr of production.

De Coursey Mountain Mining Co.'s Red Devil Mine near Sleitmut on the Lower Kuskokwim is in full production, taking advantage of the current record-high price for mercury. The company is flying out flasks in its privately-owned plane. Also, the company has begun exploration work on the DeCoursey Mountain property in the same area. Miners and prospectors are showing interest in several other quicksilver prospects, including one near Aleknagik in the Bristol Bay District.

Phil R. Holdsworth, Commissioner of Mines, revealed last month that for the first time since the "old days" a sluice box has been robbed. The robbery

(*Continued on p 152*)



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Shown above are Wire Rope products developed and manufactured by Macwhyte Company for maximum safety and economy. There are a thousand and one types and sizes of Wire Rope in Bright Steel, Galvanized Steel, Stainless Steel, and Monel Metal; hundreds of types and sizes of Braided Wire Rope Slings for materials handling; a wide selection of Wire Rope Assemblies for machine parts and controls; and Aircraft Control Cables, Assemblies, Terminals, and Tie-Rods for aircraft and other uses.

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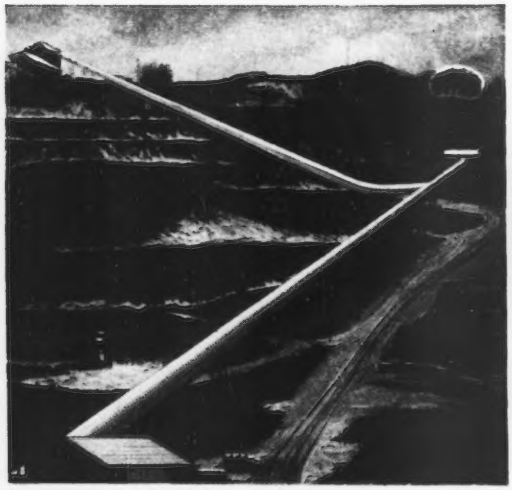
for higher and higher lifts

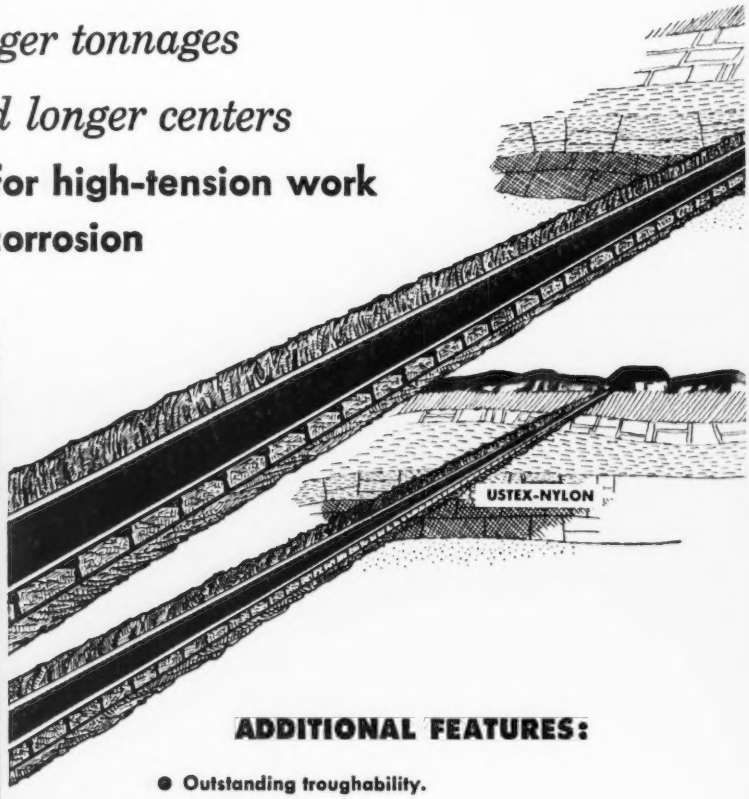
larger and larger tonnages

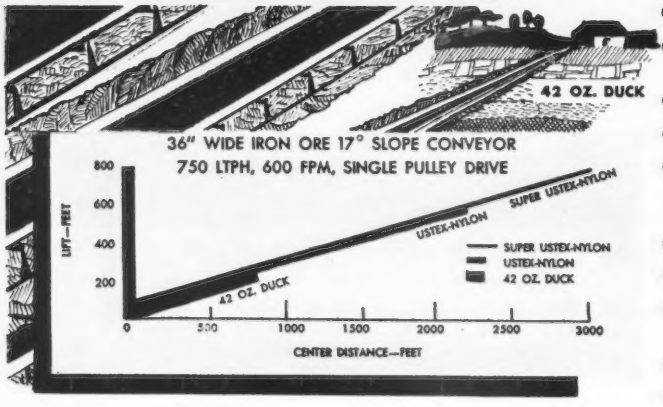
longer and longer centers

The high-strength belt for high-tension work

— — not affected by corrosion







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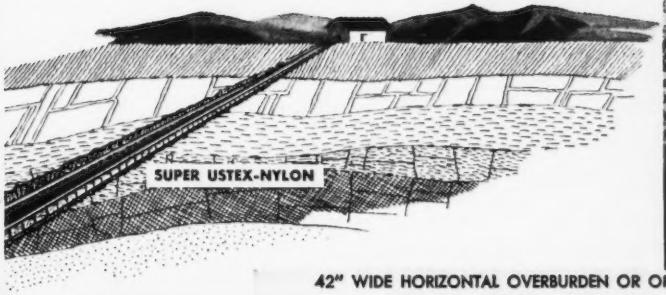
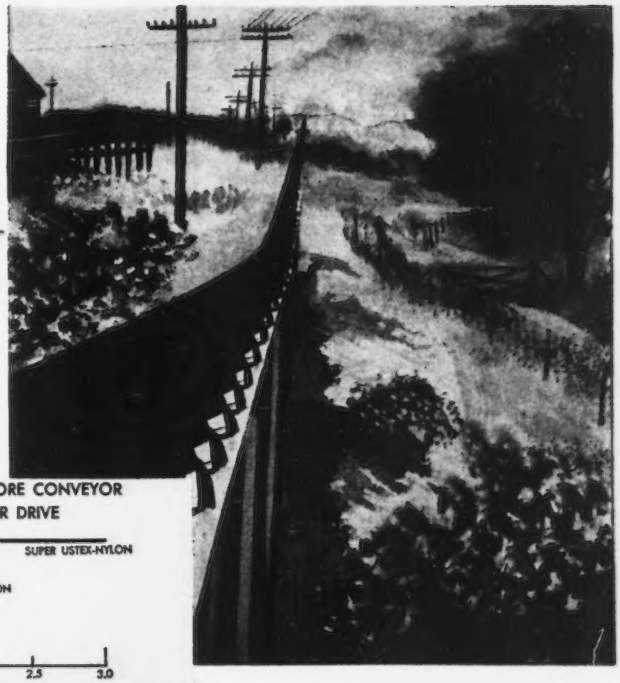
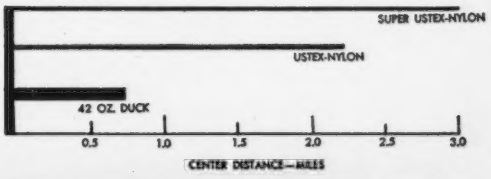
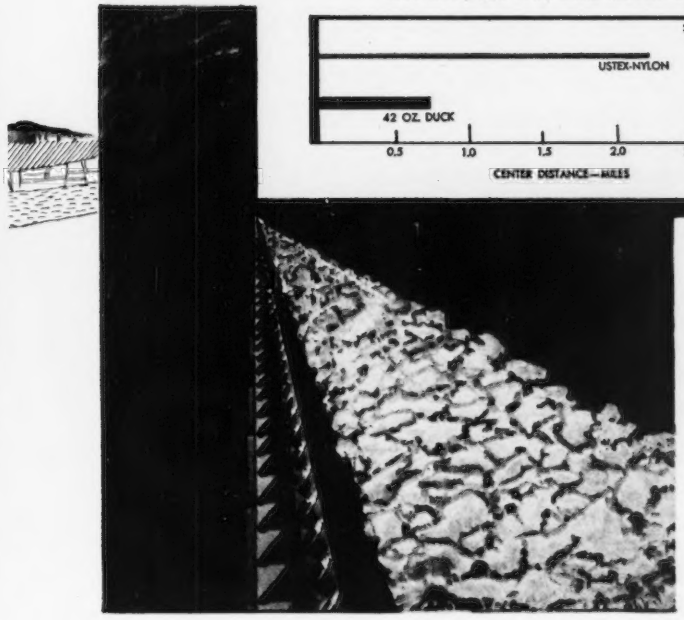




42" WIDE HORIZONTAL OVERBURDEN OR ORE CONVEYOR
1500 LTPH, 600 FPM, DUAL MOTOR DRIVE





This great new Super Ustex-Nylon Belt is the latest in United States Rubber Company's parade of Belt Champions.

In 1929, "U. S." gave mine haulage a history-making lift—by presenting the 42-oz. duck belt, later to become standard in the industry.

In 1939, "U. S." came out with the strongest belt ever made up to that time—the famous 48-oz. duck belt. So strong was this belt that the first one installed is still in active service.

In 1948, still anticipating that in the years ahead mine operators would find it necessary to haul ever-increasing tonnage up higher and higher lifts, "U. S." introduced the Ustex-Nylon Belt—to handle the great tensions that were undreamed-of years before. The first of these belts was installed in a Minnesota iron mine where it carried over 7,500,000 long tons of ore at a rate of 700 long tons per hour for several years. It was then moved to a new location and now handles 1,200 long tons per hour up a higher lift. In other words, the belt is doing twice the work it was originally designed for.

And now, in 1954, again the Iron Range takes advantage of our Three-way Engineering. A leading original equipment manufacturer specifies our latest champion, the Super Ustex-Nylon Belt for one of the foremost iron ore producers.

There is always a "U. S." sales engineer ready to work out haulage problems for you through Three-Way Engineering—the "U. S." method of working with mine engineers and the designers of conveyor equipment. Consult any of the 27 "U. S." District Sales Offices, or write to address below.

"U. S." Research perfects it..."U. S." Production builds it ... U. S. Industry depends on it...

VISIT US AT BOOTH NUMBER 2020
DURING THE AMERICAN MINING CONGRESS
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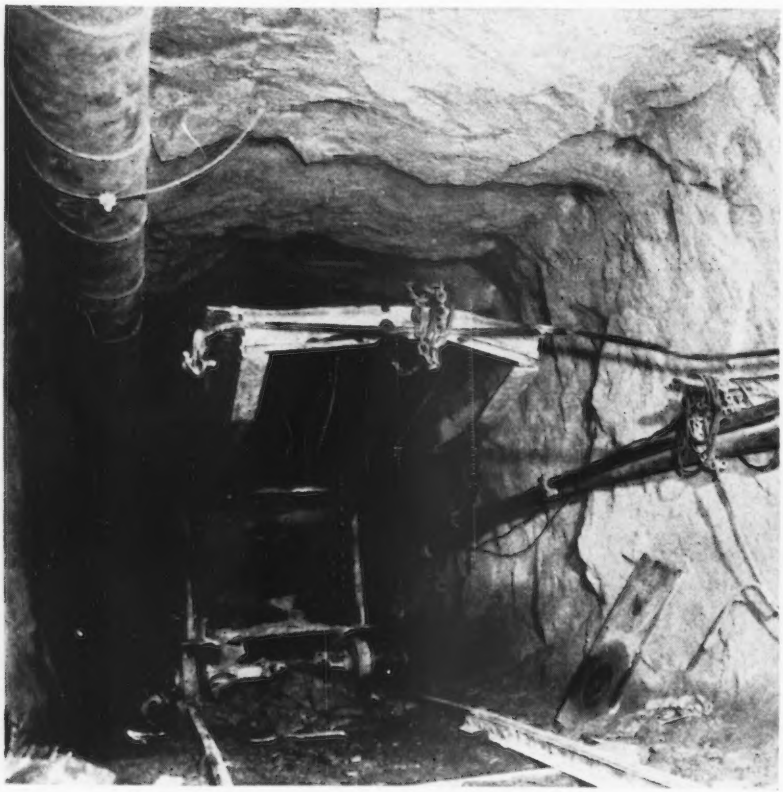
A MAJOR NEED FOR MINERS



Nothing is more important in underground operations than a dependable supply of fresh air. And nothing is more dependable in this service than Naylor lightweight pipe. Built with the exclusive lockseamed-spiralwelded truss, Naylor provides the added collapse strength and safety for push-pull ventilating service. It's easy to handle and install,—easy to extend as work progresses, particularly with the Naylor one-piece Wedge-Lock coupling to speed connections and simplify the job. Better check up on this pipe and coupling combination and find out how much it can do for you. Write for Bulletins No. 507 and No. 514.

NAYLOR PIPE

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Eastern U.S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

Alaska (*Continued from p 148*)

occurred at Fairbanks Creek in the Fairbanks District at the Martin Sather placer operation. On a night just before a cleanup was due, a culprit (or culprits) took the concentrate box from the riffles, then replaced the riffles and turned water back into the boxes. Loss was estimated at between $1500-$10,000. This crime was once considered as serious as horse-theft in the old West—and the penalty was the same.

Practically all of Alaska's gold production continues to come from seasonal placer operations. The U. S. Smelting Refining & Mining Co. remains the largest single producer, operating six dredges in the Fairbanks area and three dredges on the Nome beach.

The largest platinum producer under the United States flag, Goodnews Bay Mining Co., seasonally operates one dredge and a dragline-washing plant unit in the Bristol Bay region.

Kenai Chrome Co. has initiated hauling of the first tonnage of chrome ore from their Red Mountain deposit to the beach for shipment under a GSA purchase contract.

Deliveries to the beach at Jakolof Bay are at the rate of 100 tons per day; 3000 tons were to be ready for shipment by Sept. 1. It is expected that the ore will average 50% chromic oxide at a 2.6 to 1 chrome-iron ratio. Exploration continues on other chrome deposits by Seldovia Chrome Corp.

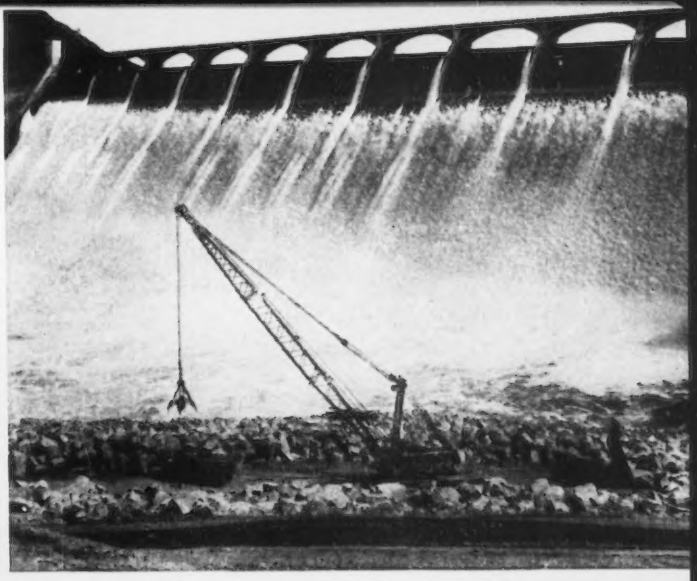
First shipment of 183 tons of tin concentrate from the Lost River Mine of U. S. Tin Corp., 90 mi northwest of Nome, has been made. This shipment consists of re-treated concentrate from the past winter's production. Future shipments will be made from current production. This is the only lode tin operation under the United States flag.

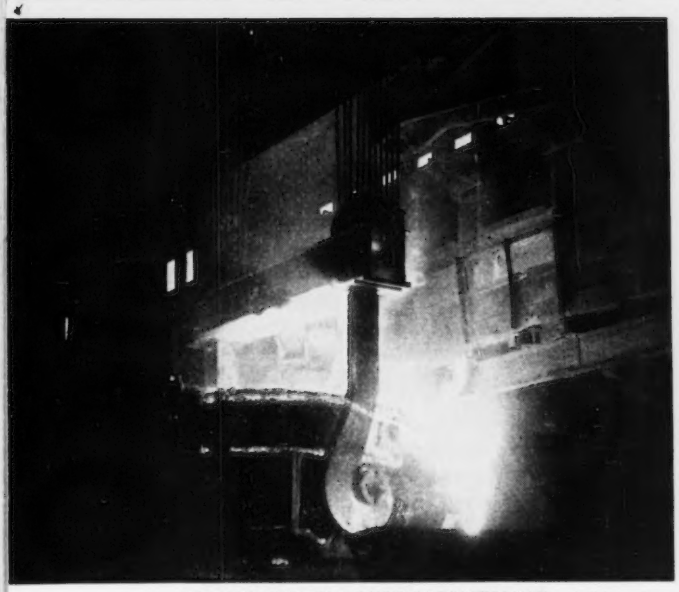
An aggressive exploration program is being conducted on the recently-discovered Maclaren River high-grade copper deposit by Alaska Copper Mines Corp., which has optioned the property from E. O. Albertson and Fred Pettyjohn, discoverers. This property is located only a few miles from the new Denali Highway under construction connecting the Richardson Highway with McKinley Park.

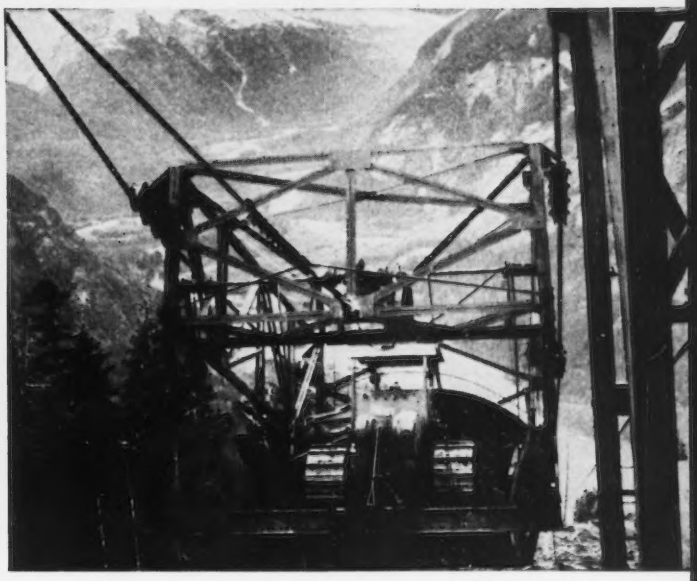
ARIZONA

Old Reliable, historic copper mine 45 mi northeast of Tucson, is in production again, 35 yr after being abandoned. The mine was established during the Civil War, enjoyed a 1907 boom and another during World War I. Lewis W. Douglas, former U. S. ambassador to England, is major shareholder in the Copper Creek Consolidated Mining Co., which has reopened the workings.

Ore is being processed at the rate of 80-90 tons daily. J. Morris Elsing of Tucson is company president. The orebody contains 3% copper. Ore concentrates are processed at Douglas.



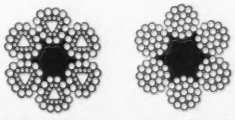




PROVING EXTRAORDINARY SERVICE—A Hercules Flattened Strand crane rope delivered 18 months service, compared to 6 months for ordinary rope. It performed equally well as a clamshell bucket rope. On a hot ladle crane it outlasted round strand rope by 4 to 1, and still tested at higher-than-rated strength. It was chosen for its super strength to haul the car on the continent's largest cableway at Kitimat.

Can Flattened Strand solve your special wire rope problem?

Hercules Flattened Strand is a special kind of wire rope that provides extraordinary service on special kinds of jobs.



Flattened Strand Round Strand

The key to the difference is the triangular shape of the strands. Notice how the strands support each other; how the rope circumference is almost perfectly round; and how the core is smaller. There is 10% more steel in Hercules Flattened Strand than in round strand ropes of the same diameter. That means *10% more strength* and *10% greater safety*. Flattened Strand wears longer and more evenly . . . and is easier on sheaves and equipment.

If you can use this Super-rope, you'll soon begin saving time, labor, money. Why not investigate?

Because Leschen pioneered and perfected Hercules Flattened Strand wire rope, Leschen is your best source of additional information. Ask your Leschen man, or write for "The Flattened Strand Story."

LESCHEN WIRE ROPE DIVISION
The Watson-Stillman Company
(A SUBSIDIARY OF H. K. PORTER COMPANY, INC.)
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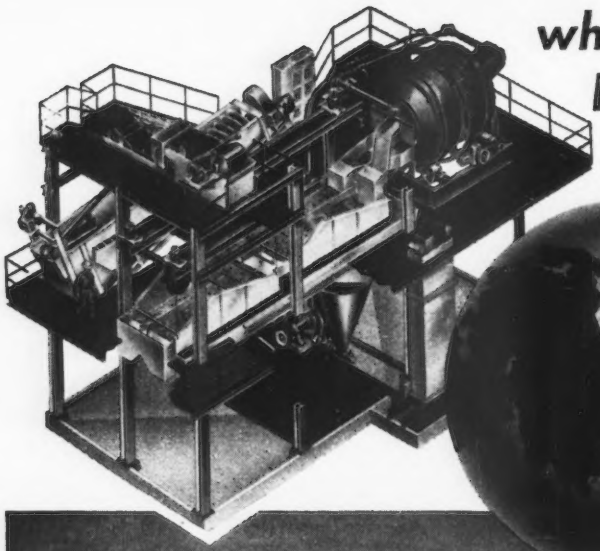
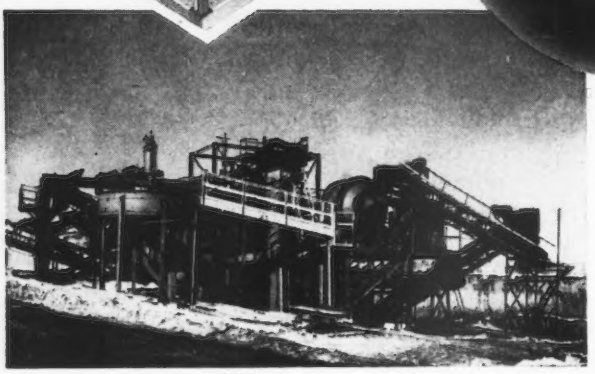
WIRE ROPE



when you consider HEAVY MEDIA SEPARATION remember:

OVER 50% of all HMS PLANTS are WEMCO MOBIL-MILLS



CUSTOM BUILT PLANTS

Wemco's extensive engineering and equipment experience is your assurance of our ability to design and install complete custom built beneficiation plants for any type mineral amenable to concentration by Heavy-Media Separation.

RENT OR PURCHASE WEMCO MOBIL-MILLS

Take advantage of Wemco's rental, rental/option to purchase, or outright purchase plans.

Write today for Bulletin M-3-M-5 and further information on the use of Mobil-Mills in mineral engineering practices.

Approximately 185 Heavy-Media plants have been placed in operation or are under construction throughout the world. Of these, 100 are Wemco Mobil-Mills located in 18 states and 15 foreign countries and having an aggregate rated capacity of **50 million** tons annually. Here is remarkable proof of Wemco's design know-how and extensive experience in the Heavy-Media Separation field.

Consistent, economical concentration of ores amenable to Heavy-Media Separation is offered by the Wemco Mobil-Mill. The superior design of this unit gives accurate control of media density and positive sink removal. It assures higher grade concentrate and lower tailings with operating costs as low as 15 cents per ton of feed. A partial list of ores being efficiently treated by Wemco Mobil-Mills includes:

LEAD	COPPER	MANGANESE
ZINC	DOLOMITE	COAL
IRON	BARITE	AGGREGATES
FLUORSPAR	BRUCITE	DIAMONDS

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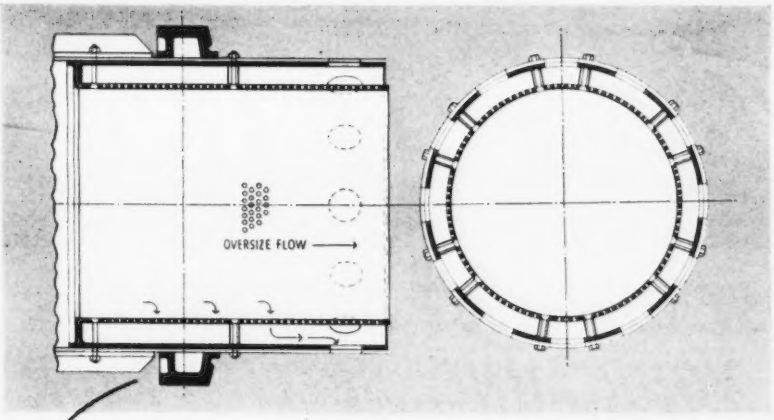
Check these important MOBIL-MILL features

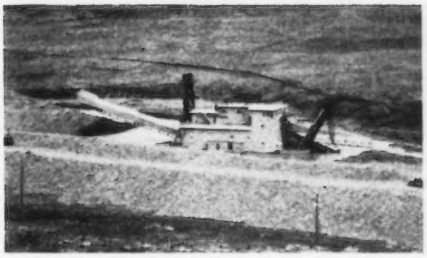
- **Prefabricated, ready to install.**
- **Fast installation at the plant site.**
- **Minimum initial and operating costs.**
- **Clean separation, higher recovery.**

Mobil-Mills are furnished in five basic sizes and several models with smaller or larger plants varying in capacity from 5 to 275 TPH. Each plant is equipped with a choice of one of the following type separators to meet your particular requirements:

1. **WEMCO SINGLE DRUM** gives positive sink removal and efficient control of media density for one stage separation over a wide range of size fractions.
2. **WEMCO TWO-COMPARTMENT DRUM** gives two stage separation in a single unit for treating ores having a middling component.
3. **WEMCO CONE SEPARATOR** gives efficient, low cost separation with ores where a finer range of feed sizes requires greater volume of medium.



First Olson trommel was built for and job proved on this YUBA 8 cu. ft. dredge, Goodnews Bay Mining Co., Platinum, Alaska.



Increase Your Screening Area Without Lengthening Screen

✓ Use YUBA-built Olson Dredge Trommel on either old or new revolving screens

Now, increase screening capacity as much as 25% without lengthening your screens, with the new Olson patented dredge trommel.

Here's how: Olson dredge trommel mounts inside present revolving screens in the area usually blanked out by circular tread rings and blank end plates. Its perforated holes convert this blank space into an inner screening area that: (a) greatly increases screening capacity or (b) provides better classification of screened material through smaller perforation sizes.

Coarse material goes out the end, as in any conventional revolving screen; but fines pass through the perforated holes of the Olson trommel onto the blank shell plate; then through large holes to join fines from the forward screening area.

✓ Order from YUBA

Edward Olson developed and proved this trommel in Alaska. YUBA now has manufacturing rights under the Olson patents, and makes these trommels of ARS plate, with taper drilled holes to size and spacings you need.

Get full use from your screen; order YUBA-built Olson trommels NOW. Send detail and general arrangement of screen, hole size and spacing, for estimates. No obligation.

74

YUBA DREDGES — PROVED DEPENDABILITY AROUND THE WORLD

YUBA MANUFACTURING CO.

Room 706, 351 California St., San Francisco 4, California, U. S. A.

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CABLES: YUBAMAN, SAN FRANCISCO · SHAWDARBCO, LONDON

A hospital, nurses quarters, and administration building are under construction at San Manuel, new copper town north of Tucson. Built by the San Manuel Copper Corp., the buildings will represent an outlay of $850,000. The hospital will contain about 20,000 sq ft of floor space.

Arizona's tax commission recently dropped Gila County mine values by $2.5-million, and touched off a chain reaction of protests.

County representatives said the county would lose some $212,500 in revenues as a result of the action and would be moved back to a second-class county. The reduction will mean an increase of $20 to each county taxpayer, county officials say.

CALIFORNIA

The new price guarantee on quicksilver won't be much help in boosting quicksilver production in the Golden State above the No. 5 spot it occupied in 1953, a survey of producers indicates.

The three-year guarantee has spurred none of the producers interviewed into expanding production. One firm, H. W. Gould & Co., reopened its quicksilver mine in Lake County the end of July, but President Malcolm Gould said the decision to reactivate it was made a month before the guaranteed price directive was made public.

Most producers agree the guaranteed price "doesn't seem too exciting." One mine official said he figures the $225 price is comparable to $75 in the early 1940's, because his costs have tripled since that time, and the Government was then paying $193 for mercury.

Greatest change in production was expected to result from increased prospecting and purchase and reactivation of defunct mines rather than boosted output of producing mines.

Bradley Mining Co. President Worthen Bradley predicted the guarantee might boost production from 17,000 flasks a year to 20,000.

Tungsten concentrate produced in the state during 1953 brought a greater return than any other metal, according to estimates just released by the U.S. Bureau of Mines and the State division of mines.

Estimated 1953 production is 213,210 units of tungsten concentrate valued at $12,792,600; 234,584 fine oz gold worth $8,210,685; 1,036,372 fine oz silver worth $937,969; 382 short tons copper which brought $219,268; 8664 short tons lead valued at $2,269,968; 5,358 short tons of zinc valued at $1,232,340; 1,700,000 long tons of iron ore valued at $12-million, and 9,290 flasks of mercury worth $1,793,249.

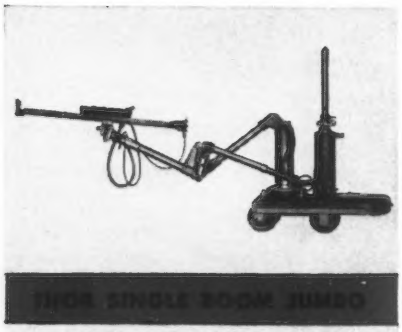
Value of other metals produced, including antimony, chrome ore, manganese ore, magnesium, molybdenum and titanium, was estimated at $6.5-million.

Judged by value of amount produced, tungsten, iron ore and gold occupied a 1-2-3 position in 1953, as in 1952.

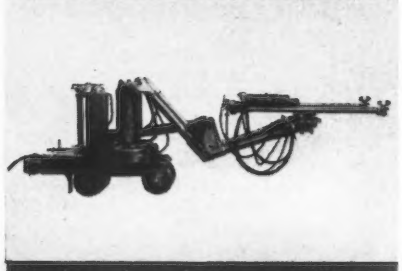
(*Continued on p 158*)

NEW Thor MINING

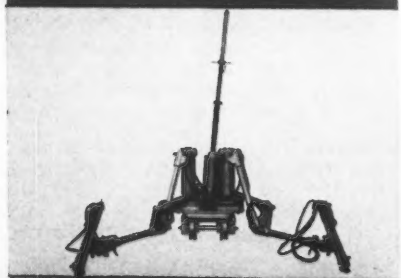
FOR FAST LOW-COST DRILLING IN YOUR MINE...SPECIFY THOR



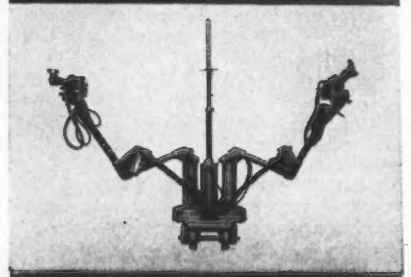
THOR SINGLE BOOM JUMBO



THOR DOUBLE BOOM JUMBO



WATER GROUND LEVEL DRILLING



EASIER OVERHEAD DRILLING

- ✓ **COMPLETELY OPERATED BY AIR**—No hydraulics.
- ✓ **EASIEST TO SET UP**—Elimination of many time-consuming operations such as blocking, use of extension rods and constant adjustment of the jack provides faster, easier set-ups.
- ✓ **EASIEST TO OPERATE**—Horizontal swing of the boom is automatically locked by air pressure . . . and may be controlled by the operator without leaving his drilling position.
- ✓ **DRILLS ROUNDS FASTER**—When air pressure is released from the boom column . . . very little effort is required to swing the boom to a new position. Apply the air pressure and drill a new hole.
- ✓ **QUICK STEEL CHANGES**—New Thor Power Feed Drifter Mountings, with rapid advance, rapid return and full power feeding at all speeds assure fast efficient drilling, faster steel changes, fewer stuck steels, and reduces total man-hours of labor per hole drilled.
- ✓ **LOW MAINTENANCE COSTS**—Hollow boom carries all supply and control pipes, protecting them from injury. Air motor may be removed without disturbing the boom. Boom actuating screw is hermetically sealed to prevent the loss of lubricant and avoid abrasive damage by foreign matter.

New Thor Jumbo easily disassembles to 3 parts facilitating handling in mine cages.

Illustrated is Two-Boom style . . . One-Boom and Special Models available, details on request.

SPECIFICATIONS

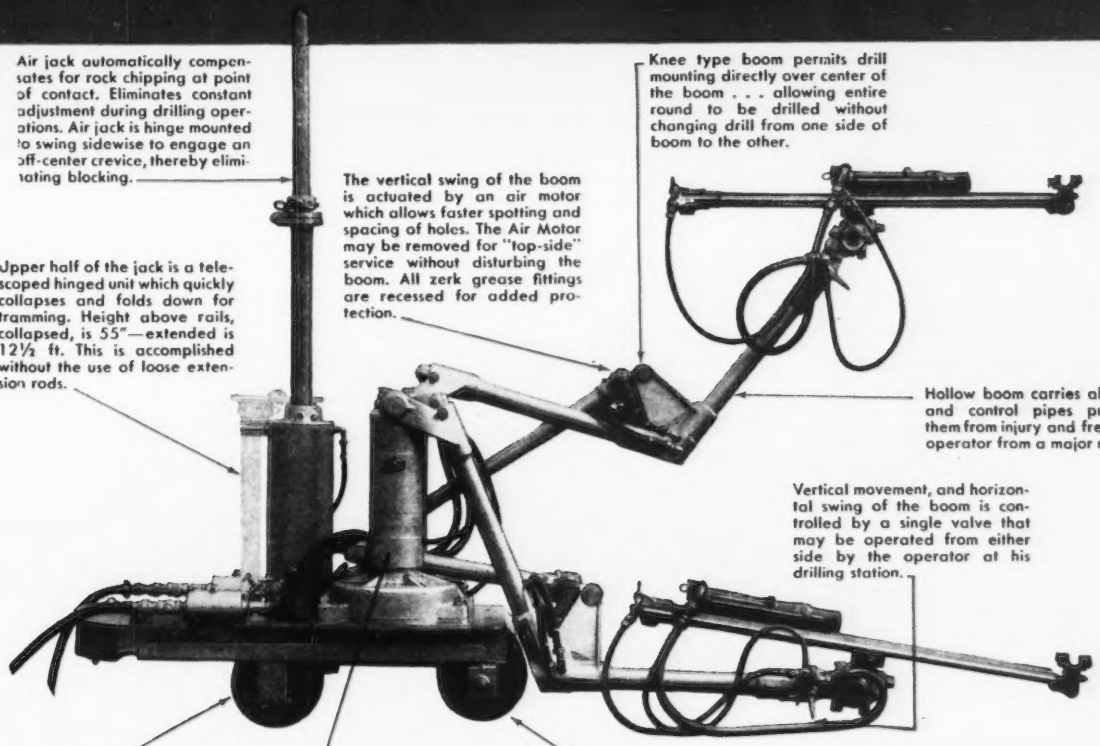
	1 Boom DB-100	2 Boom DB-200
Size of Chassis	18" x 35" x 80"	18" x 35" x 80"
Wheel Base	36"	36"
Track Gauges	18"	18"
Size Heading Recommended	8' Wide x 10' High	12' Wide x 10' High
Weight Bare	3600 lbs.	6000 lbs.
Crated For Domestic	3700 lbs.	6100 lbs.
Boxed For Export	4000 lbs.	6400 lbs.
Air Lines	1" Hose	1" Hose (Double)
Water Line	½" Hose	½" Hose (Double)

Boom Column Complete: Bare.....1530 lbs.
Crated For Domestic.....1650 lbs.
Boxed For Export.....1750 lbs.

NOW IN PRODUCTION

JUMBO

DESIGNED BY THOR ENGINEERS IN CLOSE COLLABORATION WITH ENGINEERS OF THE MINING INDUSTRY



Air jack automatically compensates for rock chipping at point of contact. Eliminates constant adjustment during drilling operations. Air jack is hinge mounted to swing sidewise to engage an off-center crevice, thereby eliminating blocking.

Knee type boom permits drill mounting directly over center of the boom . . . allowing entire round to be drilled without changing drill from one side of boom to the other.

The vertical swing of the boom is actuated by an air motor which allows faster spotting and spacing of holes. The Air Motor may be removed for "top-side" service without disturbing the boom. All zerk grease fittings are recessed for added protection.

Upper half of the jack is a telescoped hinged unit which quickly collapses and folds down for tramming. Height above rails, collapsed, is 55"—extended is 12½ ft. This is accomplished without the use of loose extension rods.

Hollow boom carries all supply and control pipes protecting them from injury and freeing the operator from a major nuisance.

Vertical movement, and horizontal swing of the boom is controlled by a single valve that may be operated from either side by the operator at his drilling station.

Rear wheels are spring mounted allowing car body to set on the track when the air jack exerts pressure on the ceiling or back . . . This feature makes the car a rigid platform for the operation of the drill—eliminates time consuming clamping and blocking operations.

Boom column air piston under pressure automatically locks the horizontal swing of the boom preventing boom drift and binding during drilling operations. When air pressure is exhausted boom will swing with very little effort.

Large 14" wheels mounted on Timken Bearings for easy rolling. Wheel treads are 3½" wide to compensate for variable gauge track. Practically eliminates de-railing difficulties.

FIELD-TESTED FOR 3 YEARS

THIS new Thor engineered Jumbo with simplified operating controls, is packed full of new design features . . . features that will speed your drilling operations. You can set up . . . drill a round . . . and remove this Thor Jumbo from the face in less time and with less effort than any other similar machine on the market today. Write for additional information on how this new Thor Jumbo will speed your mining operations . . . or, if you request we will send a Thor Mining Engineer to give you personal on-the-job assistance. Write Thor Power Tool Company, Aurora, Illinois.

Thor

THOR POWER TOOL COMPANY
AURORA, ILLINOIS

EXPORT DIVISION 330 W 42nd STREET, NEW YORK 36, NEW YORK

CALIFORNIA (*Con't from p 155*)

Total 1953 mineral production in the state was estimated at $1,244,218,079, a 2% increase over 1952. If the final 1953 figure checks with the estimate it will be an all-time high.

COLORADO

San Juan Mining & Developing Co. has announced plans to operate the old Esmeralda gold mine in Silverton District. Chas. H. Turner, Ouray mining engineer, who is president and manager of the corporation, advises that road work, tunnel rehabilitation, mapping and sampling have been in progress for three months.

The metallurgical processes pilot plant operated at the Atomic Energy Commission compound in Grand Junction by American Cyanamid Co. was taken over July 1 by National Lead Co. The plant is a subsidiary of the AEC raw materials development laboratory in Winchester, Mass., which also is to be operated by National Lead. A new pilot plant is to be constructed at Grand Junction.

Rex R. Babb of Ouray says he has uncovered uranium in commercial quantities in a number of veins located around and near Bear Creek Falls, three miles above Ouray on the Million Dollar highway. His first samples sent out from a foot wide vein alongside the road showed values in uranium .307 and in vanadium .07.

Vanadium Corp. of America announced it planned to add new facilities to its Durango plant to process an increased flow of uranium ore. To provide necessary facilities for processing this ore, AEC has approved the addition of another roaster and other auxiliary equipment at the company's Durango plant. These additions, William C. Keeley president, said, will increase moderately the company's deliveries of uranium to the nation's stockpile.

Golden Cycle Corp. is continuing development work on several levels of the Ajax Mine in the Cripple Creek mining district and has opened up additional bodies of good ore.

Operations of the Carlton mill have continued on a fairly satisfactory basis, but, due to a shortage of ore production, the mill is now operating on a somewhat reduced basis.

Golden Cycle Corp. reports that "mining operations on our uranium property on Atkinson Mesa near Uravan, commenced the early part of March. Daily production is gradually being increased. The grade and character of ore produced to date have exceeded our expectations. We have examined numerous uranium properties during the past months and as a result just acquired a large group of claims on the east end of Monogram Mesa in Montrose and San Miguel counties in Colorado."

Colorado Mining Corp. has taken over the Farwell Mountain Copper Co. property 5 mi northeast of the town of Hahns Peak. The old Farwell road, first built in 1879, is being resurveyed and mapped, preparatory to reconstruction.

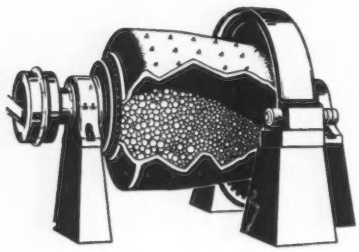
President of the new company is George Roberts of New York City. Manager is G. F. Schrieber of Brighton, a mining engineer and geologist. Arthur N. Sweet of Denver is associated with Schrieber. W. I. Hoklas of Steamboat Springs is field manager. The property has not been operated for 22 years.

AEC has about 15 field parties engaged in geological reconnaissance within the 107,000 sq mi area of the Colorado Plateau.

There are 7 active AEC drilling projects with 1500 ft of hole made daily; average depth of the holes is about 150 ft. U. S. Geological Survey drills an additional 1500 ft daily, with an average hole depth of 350 ft. AEC and the USGS employ about 150 geological personnel. Private prospectors now exceed several thousand in number.

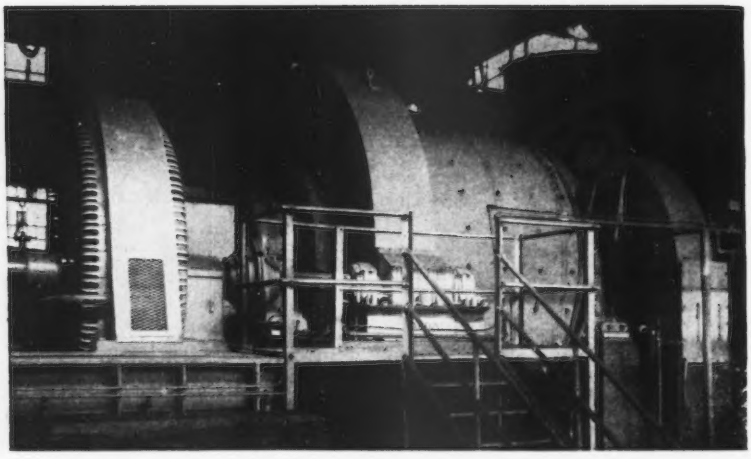
An amendment to the 1953 contract of Vanadium Corporation of America with AEC has been agreed upon by the two parties.

Under provisions of the new agree-



SEE OUR EXHIBIT AT THE MINING SHOW

TRICONE MILLS



11' Hardinge Tricone Mill at Tennessee Copper Company which has produced a remarkable efficiency increase in their grinding circuit. The Tricone has many operational advantages over other types of ball mills. Write for Bulletin AH-414-1.

HARDINGE
COMPANY, INCORPORATED

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ment, extending the contract into 1958, Vanadium Corp. derives the right to install the necessary equipment to concentrate at its Monument Mine No. 2, in northeast Arizona, vanadium-uranium ore which heretofore has not been considered as mill grade.

Also, to provide the necessary facilities for processing this ore, AEC has approved the addition of another roaster and other auxiliary equipment at the company's Durango plant. These additions will increase moderately the company's deliveries of uranium to the nation's stockpile.

Zodomoc Mines, Inc., of which Karle S. Goff of Durango, is vice president, has just made another shipment of gold ore from its Bessie G Mine. The company is installing a concentration mill. Bessie G is located 27 mi from Durango in the La Plata mountains at an altitude of 12,000 ft and is the only operating gold mine in La Plata County.

Regulations tightening state control over public offerings of uranium stock have been put into effect by Colorado's securities commissioner, Curtis White.

Uranium companies seeking state approval for selling their stocks in Colorado must furnish the commissioner a survey certificate prepared and signed by a mining engineer or registered land surveyor showing location of claims.

The companies must also submit a report prepared by a mining engineer or geologist describing the property, geological features, mineralization, occurrences and disposition of orebodies and "any other features of which the investor should be reasonably informed."

White has also ordered the uranium companies to submit a listing of the principal mineral constituents of any orebodies or deposits. The listing must describe the methods used in determining the mineral content, the results of any testing and the nature of the title under which each property is held or is to be held.

If the claims are unpatented, the companies must file a statement of interest in these claims known to the issuer along with the title opinion, copy of leases, contracts and assignments.

IDAHO

Development work at the Vulcan-Galena project on Lake Gulch west of Wallace is progressing rapidly with production slated to begin in the first quarter of 1955, probably late in January.

The four-compartment main shaft from the 3000 to the 3400 level has been completed and a station and pockets are being cut for the new 3400-ft level. Sinking was started last February and the bottom was extended to about the 3565-ft horizon, providing 165 ft of sump and pocket room below the new level.

J. E. Berg, general manager, northwest mining department, American Smelting & Refining Co., operating firm, said that as soon as the station and pockets are cut, a south crosscut will be started to open the downward extension of vein structures already exposed and partially developed on upper levels.

Principal target will be the tetrahedrite vein discovered early last year on the 3000 level and since explored upward to the 2400 level.

Meanwhile, four headings are being pushed concurrently to provide ventilation openings and a second escapeway.

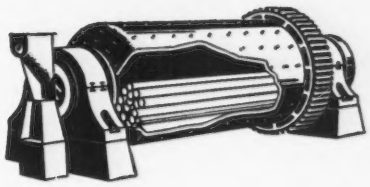
In a special National Labor Relations Board bargaining election July 22, the United Steelworkers of America (CIO) ended the long reign of the International Union of Mine, Mill and Smelter Workers (Ind.) as collective bargaining representative for employees of Sunshine Mining Co.

The vote was 262 for the Steelworkers to 225 for Mine-mill, with one vote void and three for neither union. A total of 609 employees were eligible to vote.

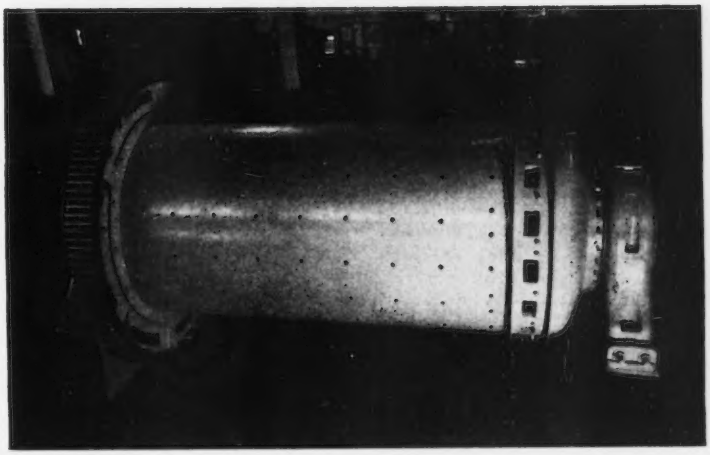
The Sunshine victory was the Steelworkers' first in the Coeur d'Alene District, and union officials have announced their intention of using this foothold to expand other properties in the District.

The fight to unseat Mine-mill at Sunshine was headed up by employees who were Mine-mill members, some of them former officers. The main issue was the

SEE OUR EXHIBIT AT THE MINING SHOW



CONVEX-HEAD ROD MILLS



Shop view of a 6' x 12' Hardinge Rod Mill for dry grinding coke breeze. Note peripheral discharge ports—an optional feature. The convex heads provide a receiving pocket which facilitates entrance of the feed to the grinding charge uniformly, without overloading. Bulletin 25-C-1.

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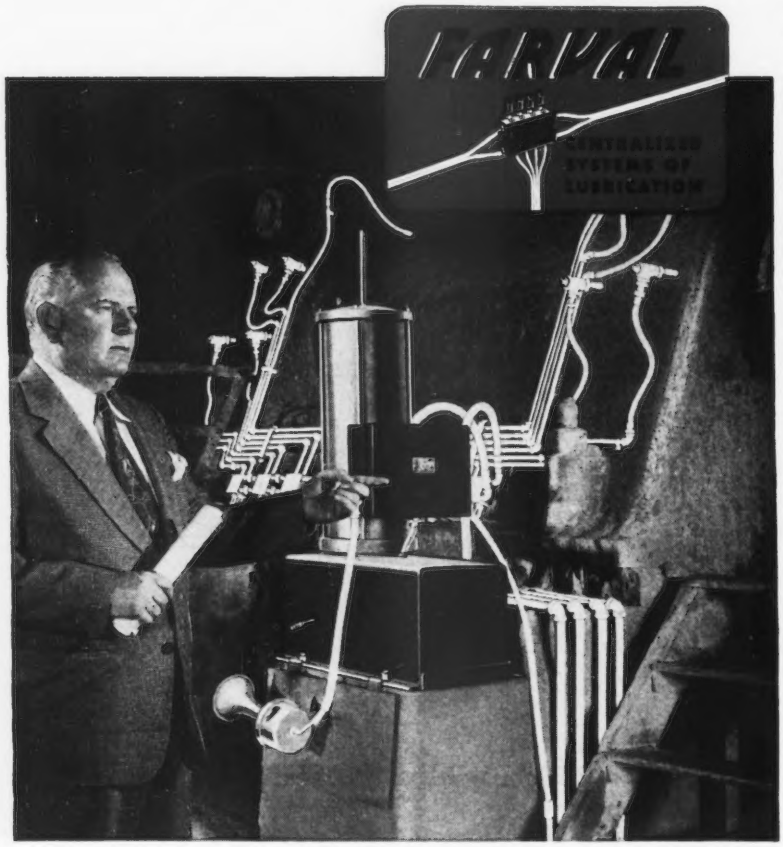

PRESIDENT FARVALIZES A STONE CRUSHER

Here's how centralized lubrication saved a plant $17,680 in 4 years!

MANAGEMENT of this cement plant had a problem: How to reduce maintenance expense on a large stone crusher.

Plant records showed too many bearing failures year after year—a consistent bearing replacement expense around $1,000 every year—despite the fact that one man had a full-time job greasing the machine. To solve this problem, management decided to spend $900 to *Farvalize* the crusher! Here's the result:

In the four years since Farval has been operating, *there has not been one single bearing replacement.* Farval has also saved $3,000 per year on lubricating labor, because Farval lubricates all bearings mechanically. Grease consumption dropped 56%, saving another $420 each year. To date, total savings run to $17,680. All this comes from an original Farval investment smaller than one year's bearing replacement cost!

FARVAL is the foolproof Dualine system of centralized lubrication that delivers a measured amount of clean lubricant at regular intervals to every bearing. From a central station, lubricant is pumped under pressure to a measuring valve at each bearing, delivering the exact amount of lubricant required.

FREE LUBRICATION SURVEY

Let us send one of our lubrication engineers to inspect your plant equipment. Without obligation, he will present a written analysis of what Farval can do for you. Write also for free Bulletin 26 for the complete Farval story.

The Farval Corporation

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Farval is an affiliate of The Cleveland Worm & Gear Co., Represented in Canada by Peacock Brothers, Limited

alleged Communist leanings of Mine-mill's international leadership. It was on this charge that Mine-mill was expelled from the CIO a few years ago.

Lookout Mountain Mining & Milling Co.'s exploration crosscut from the 1200-ft level of the Sunset Minerals shaft has entered a badly broken and faulted zone with continuous water seepage and intense bleaching and alteration which indicates that it may be nearing its main objective, the downward extension of the Lookout vein which yielded rich lead ore from early-day workings near the surface.

Hypotheek Mining & Milling Co. has resumed diamond drill exploration at its East Hypotheek property on Pine Creek under a DMEA project contract. One hole is being run northward at a down angle from the north surface tunnel to probe for a structure which outcrops at the surface about 400 ft north of the tunnel portal. Another 650-ft horizontal hole to the south is expected to intersect three structures indicated on the surface.

Bradley Mining Co. may be able to resume operations at its vast mining, milling and smelting plant at Stibnite in Valley County if the deficiency which has developed in the free world's supply of antimony continues, according to John D. Bradley, executive vice president of the company.

The Stibnite produced more than 90% of the domestic output of antimony before it was forced to shut down in 1952 because of the low antimony price. The present supply deficiency is the result of the low price which has prevailed for the past two years, he said.

Silver Leader Mines Inc. and Silver Center Mining Co. have sold their properties in the Hunter Mining District east of Mullan to Uranium Mines Inc., an Idaho corporation organized early this year which has extensive interests in uranium properties on the Colorado Plateau.

The Silver Lead property consists of 70 claims which adjoin on the east the Silver Mountain Lead property which is now under development by Hecla Mining Co. and Bunker Hill & Sullivan Mining & Concentrating Co. The 120-claim Silver Center group extends easterly from Silver Leader to and beyond the Idaho-Montana border.

Depressed prices in the lead-zinc mining industry are causing more and more Coeur d'Alene District companies to turn their attention to the potentially more lucrative field of uranium mining.

Among the recent entrants into the uranium field are Western Silver-Lead Corp. and Square Deal Mining and Milling Co., which have taken a joint lease on the 8-claim Juanita group in the Yellow Cat District of Grand County, Utah, one of the largest producing districts on the Colorado Plateau.

A contract has been let and work is in progress on a program of test drilling which will total between 5000 and 6000 ft of coring in about 60 holes. The property, according to engineers' reports, has enough commercial grade ore exposed at

"Me Switch? ...Never!"

"OK! SO I AM PIG-HEADED! I gave up trying other ropes years ago. It pays me to standardize on Roebling. Why? Well, with Roebling I get exactly the type of rope I need, when and where I need it... no makeshifts... no delays... and the performance is tops."

* * *

Why not find out for yourself? Call your nearest Roebling office or distributor for a Field Man. He'll recommend the ropes that perform and stand up best in the mines. And you'll learn what service really means!

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Subsidiary of The Colorado Fuel and Iron Corporation

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Throughout years of steady progress these standards were the basis for the drilling bits that are now recognized as unbeatable the world over.

HARDHED matrix for non-abrasive formations
HARDHED 40 matrix for average drilling conditions
HARDHED 55 matrix for extremely abrasive formations

When you next need a diamond drill bit which no formation will slow up, gives full core recovery, faster penetration *AND* saves you *days* and *dollars* in coring and drilling, contact your nearest J. K. Smit field representative or write us direct for literature and assistance.

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the surface for a limited operation and has been certified by the Atomic Energy Commission to receive the initial production bonus of $3.50 a pound for the first 10,000 lb of U_3O_8 produced.

Mascot Mines, Inc. also has acquired a uranium prospect—the Alto groups on Beaver Mesa in the Gateway District of Mesa County, Colo.

Highland-Surprise Consolidated Mining Co. is negotiating with the owners of several uranium prospects in the Moab area of southeastern Utah with the view of undertaking an exploration and development venture if a satisfactory deal can be arranged.

Other Coeur d'Alene District firms who entered the uranium field earlier are moving ahead with their exploration programs.

U. & I. Uranium, Inc., the operating company for six Kellogg firms—Caledonia Silver-Lead, Silver Bowl, Signal, Coeur d'Alene Silver Giant, New Era and Nancy Lee Mines—reports "exceptionally encouraging" results from its initial drilling program on the Hot Rock and Radon properties in the Big Indian Wash area of San Juan county. Details of the drilling results are being withheld pending completion of an Atomic Energy Commission check.

Hypotheek Mining & Milling Co. is nearing completion of its first test hole on a 10-claim property in the Coyote Wash section of San Juan County, Utah.

National Uranium Corp. has acquired another prospect, this one an eight-claim group in the Seven Mile area of Grand County, Utah, north of Moab. The firm already had a lease on a 10-claim property on Coyote Wash.

Vulcan Uranium Mines, Inc., formerly Osburn Silver-Lead Mining Co., has completed extensive bulldozing and stripping along the area showing highest concentration of radio-active ore on its 10-claim group in the San Rafael Swell area of Emery County, Utah. The work exposed a mineralized zone approximately 300 ft long and 3 to 7 ft wide which showed nucleometer readings indicating a uranium content ranging from 0.20 to 1.5% uranium.

Lookout Mountain Mining and Milling Co. has completed a thorough examination and sampling of its 34-claim Wasatch prospect in the southwestern corner of Wyoming in a search for the main deposit from which the uraninite on the claims eroded. Results of the sampling, including Atomic Energy Commission reports, are expected to be available soon.

Sunshine Mining Co.'s production during the first six months of 1954 averaged more than 1000 tons per month more than during the comparable period of last year. First-half output this year totaled 133,481 tons, an average of 22,247 tons per month, as compared with 126,205 tons, or 21,034 tons per month, during the first six months of 1953.

Bunker Hill & Sullivan Mining & Concentrating Co. has started lateral exploration on the new 3200-ft level at its Crescent Mine in the Silver Belt of the Coeur d'Alene District, directly across Big Creek cayon from Sunshine Mine.

There's a lot you can't see...

when you look at a PAYLOADER® tractor-shovel.

YOU CAN'T SEE the 34 years of pioneering experience in building hydraulic tractor-shovels — MORE experience than all others combined!

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By keeping drifts open . . .

"COMMERCIAL" STEEL SETS
Reduce Costs in Block-caving Mining

Block-caving method of ore mining is more profitable when "Commercial" circular steel sets are installed in mine drifts because more continuous and more uniform draw of ore reduces mining costs. Circular steel sets provide support needed to keep the drifts open and serviceable long after timber sets would fail even in heavy ground.

The installation of "Commercial" steel sets is simpler and easier than standing timber; normal maintenance cost is less because minor repairs are reduced to a minimum. Costly shutdowns and delays are avoided; in fact, the entire operation is speeded up.

"Commercial" was first to produce circular steel sets. An established product for years again has found acceptance in another more recent application which has helped to reduce the hazards in block-caving mining.

Pounds of "Commercial" circular sets will increase the ore draw in tons.

THE COMMERCIAL SHEARING AND STAMPING COMPANY
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"COMMERCIAL"
"PRODUCTS PREFERRED BY CUSTOMER ACCEPTANCE"

"Commercial" engineers will gladly assist you; they have the experience and know how.

LINER PLATES · RIBS · SETS · LAGGING

4A-2

Exploratory crosscuts are being run both north and south from the shaft station on a three-shift-per-day basis. The new level is 2000 ft deeper than any previous exploration in the mine, and is about 500 ft below sea-level. The shaft-sinking and deep-exploration program is being done under a $1,098,750 contract with DMEA.

Idaho Custer Mines Inc. has started work in the first stage of its DMEA project at the Livingston Mine in Custer County. This will consist of four down-holes, each approximately 250 ft long, from the 2400 level workings. When the drilling is completed the winze will be sunk to a depth of 200 ft below the 2400 level to permit additional deep exploration.

MINNESOTA

Washing plant of M. A. Hanna Co.'s Carlz Mine at Keewatin has added a single unit 32x68x24-ft heavy media section and a 44x34-ft three-story jig section. The heavy media unit will treat plus 3/16-in., minus 1 1/4-in. material.

With a crude-ore feed of 250 tph, estimated concentrates will be about 130 tph. The jig unit will handle minus 3/16-in. classifier product. Maximum feed rate of 250 tph will produce concentrates about 80 tph.

These plant additions are indicative of the continuous effort in the Iron Country to obtain a higher percentage of recovery and higher-grade concentrates.

An end of the 1954 shipping season is possible by mid-November. Some 75 of the 275 lake ore carriers had been taken out of service by Aug. 1. Stockpiles of iron ore at lower lake ports and furnaces are the largest since 1938. Total 1954 shipments are expected to be about 70% of those in 1953. Around 30-million tons had been shipped as of Aug. 1. Steel plants were reported to be operating at about 65% of capacity.

Stripping began at the Morton mine of M. A. Hanna Co. in January 1950. In June 1954, the first Morton open pit ore was shipped. The Morton was opened and developed as an underground operation between 1912 and 1917 during which time it produced 205,288 tons of ore.

As of last July 1, about 22-million cu yd of stripping had been removed with an estimated 8-million cu yd more still to be handled. Stripping at the Morton is one of the deepest on the range, averaging 180 ft with a maximum of 220 ft. When the stripping area is completed it will form a 2200x4000 ft oval-shaped pit, of which about 2200x2200 ft has been stripped to date.

For development, the mine was divided into an eastern and western area. With work in the western area near completion, the drag line-conveyor stripping equipment was moved into the easterr section this year. It has about two years of work ahead. First ore from the eastern area is to be shipped in 1957.

The combination crushing, screening and washing plant is in operation. It is designed to handle a maximum of 1000 tons of crude ore per hour with a max-

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Announces The New 3-yd.

71-B

Shovel
Dragline
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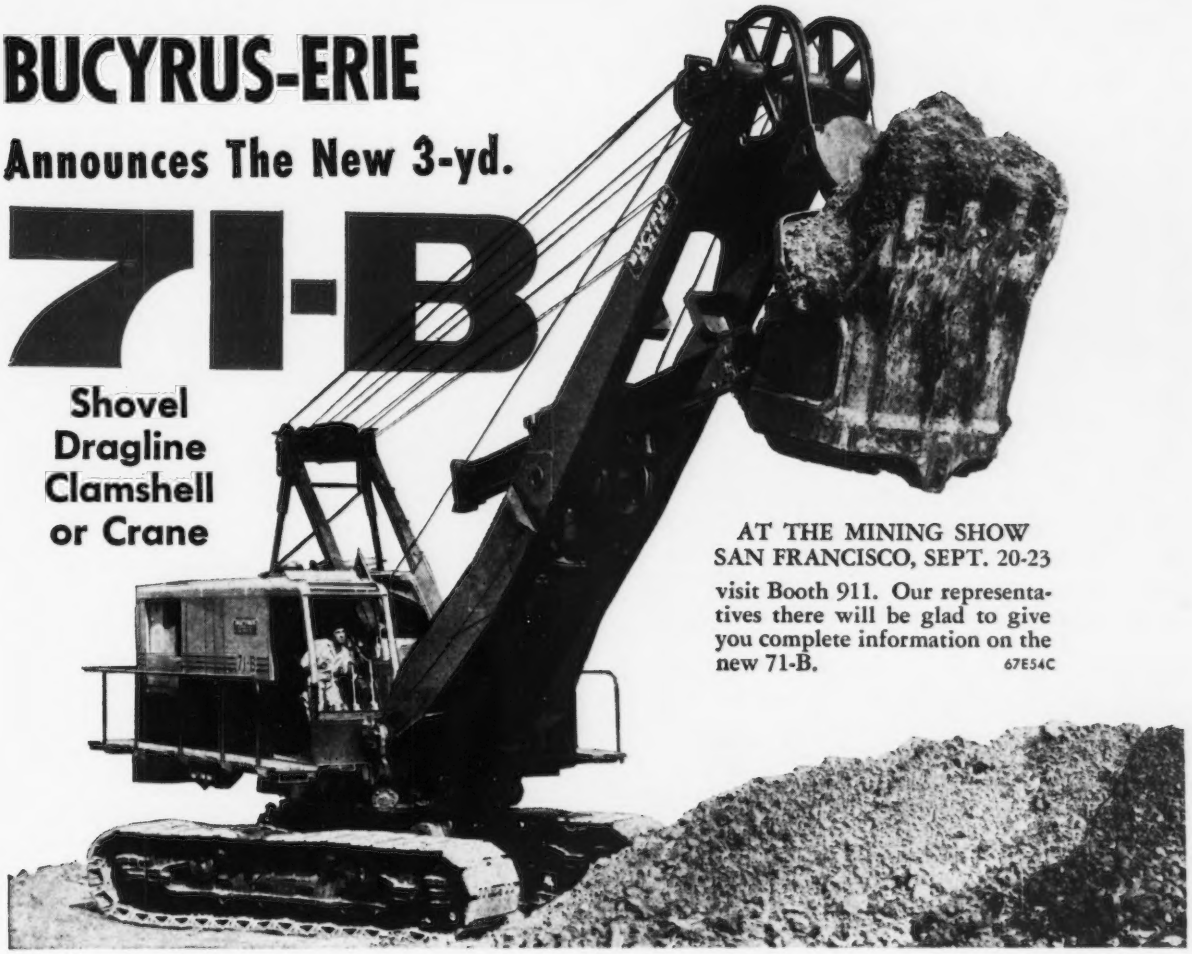

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To meet the demand for a convertible 3-yd. excavator capable of high-speed, high-output performance, Bucyrus-Erie has developed the new 71-B. Designed from the ground up as a completely new machine, it has outstanding features that have been field-proved on other Bucyrus-Eries through thousands of machine-years of service.

- POSITIVE TWIN-ROPE CROWD
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These and other features give the new 71-B a balanced and rapid work cycle for continuous high output, along with the durability for sustained operation and long life. For more information on this outstanding new excavator see your nearby distributor.

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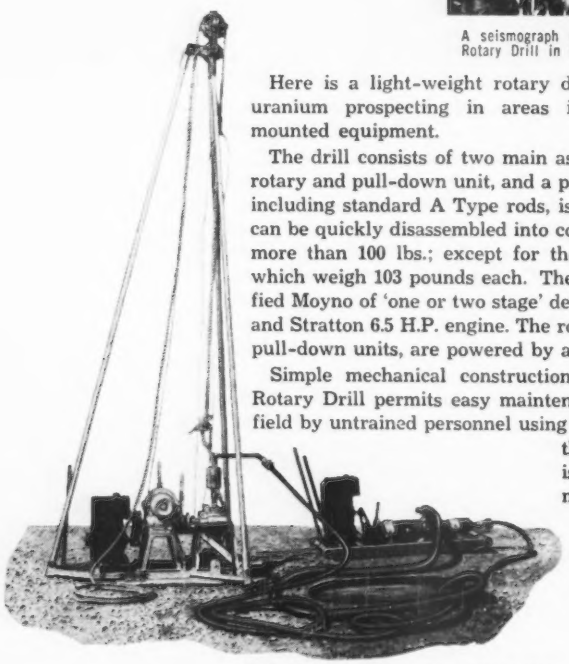
A seismograph crew using the A-3 Portable Rotary Drill in the jungles of South America



Here is a light-weight rotary drilling rig suitable for uranium prospecting in areas inaccessible to truck-mounted equipment.

The drill consists of two main assemblies — a combined rotary and pull-down unit, and a pump unit. Total weight, including standard A Type rods, is about 800 lbs. The rig can be quickly disassembled into components, weighing no more than 100 lbs.; except for the two gasoline engines which weigh 103 pounds each. The mud pump is a modified Moyno of 'one or two stage' design driven by a Briggs and Stratton 6.5 H.P. engine. The rotary table, cathead and pull-down units, are powered by a similar engine.

Simple mechanical construction of the A-3 Portable Rotary Drill permits easy maintenance and repair in the field by untrained personnel using no special tools. Where the use of such vehicles is practicable, the drill may be jeep-mounted.

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imum concentrates output 600 tph. Ore is hoisted up a 510 ft, 25 deg incline by two 30 cu yd skips operating in balance on a single drum, 1250 hp hoist. Hoisting capacity is 1000 tph, sufficient to supply the plant with its maximum treatment tonnage.

First of twin hulls which will carry the world's most powerful dredges was launched at Steep Rock Lake July 13 by Construction Aggregates Corp. That organization will remove an estimated 160-million cu yds of silt from the east bay of Steep Rock lake to allow Caland Ore Co., Ltd., (Inland Steel Co.) to mine a large deposit of iron ore which lies beneath the lake. One of the largest dredging operations ever undertaken, it is scheduled for completion by 1960.

Construction Aggregates Corp. also did the dredging for Steep Rock Iron Mines Ltd. This first hull to be launched is named for Clarence B. Randall, chairman of Inland's board. Its twin, scheduled for launching late in August, will be named for Joseph L. Block, president of Inland Steel Co.

Last of 12 houses has been moved from the Wacootah mine near Mountain Iron to clear the way for future operation of the Pacific Isle Mining Co. The Wacootah shipped 33,800 tons in 1953. It was operated by the Wheeling Steel Corp. from 1931 to 1951 and had shipped a total of 7,676,382 tons up to the 1954 season.

Stripping for the Pacific Isle Mining Co. of Hibbing is being carried on, under contract, by Johnson & Moore at the Graham No. 2 mine in Mesaba Township. The Graham No. 2 adjoins the Wentworth mine (Jones & Laughlin Minnesota Ore Division) on the west. It is one of two forties held by Zontelli Brothers as the Graham mine and was subleased to Pacific Isle.

First crude ore was loaded at the Graham No.2 on July 26. Concentration of crude ore from the property will be handled at the Coons-Pacific Concentrator near Eveleth, which is operated jointly by the E. W. Coons Co. and Pacific Isle Mining Co.

The W. S. Moore Co., of which H. E. Reese is operating general manager, began stripping at the Gilbert Silver mine at Gilbert July 19. Available tonnage has been estimated at 40,000 tons. No shipments have yet been made from the property.

Two former Chisholm mining men, Walter Steinke and Mel Ranta, report that they will start operations at once on "extensive outcroppings of high grade magnetic iron ore" 7 mi east of Fort Frances, Ontario, Canada; about 140 mi northwest from Duluth. The ore outcrop was discovered by Steinke after more than a year of prospecting in that area. The company, known as Stanol Minerals, Ltd., expected to ship the first ore about Sept. 1 by Canadian National R.R. They plan to add a crusher and screen to their equipment next year.

Two operating units of Oliver Iron Mining Division's Hibbing area received

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Throughout the entire world Coromant tungsten carbide tipped integral drill steels have proved their right to leadership. Consistent uniformity—lower cost per foot of hole drilled, freedom from connection troubles, longer drilling life and Copco on-the-job service—these things have made them the only logical choice wherever drilling costs are most closely watched.

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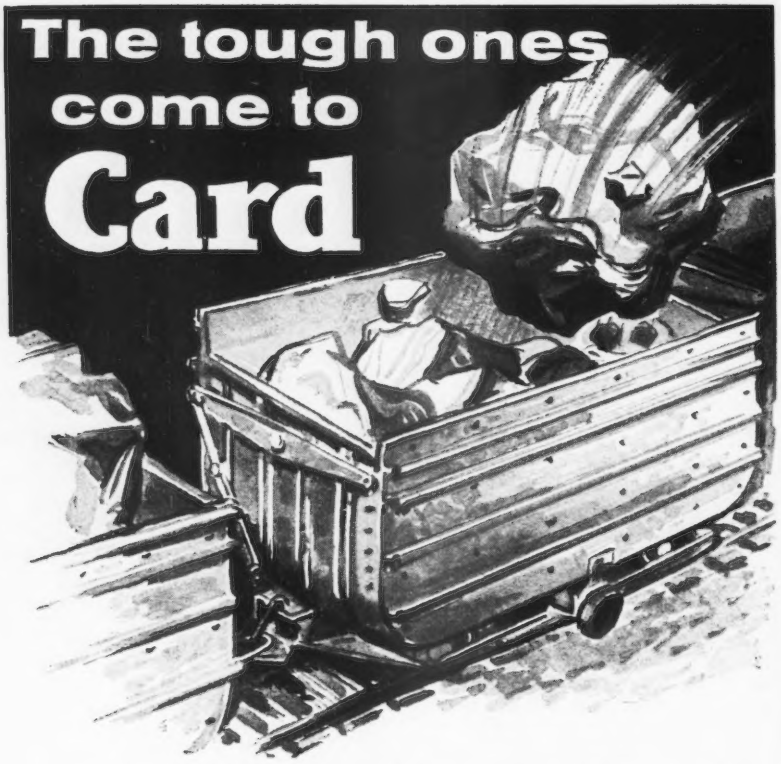

In hard rock mining, haulage equipment takes a real beating. Three-ton boulders drop ten feet and more into mine cars with a force that dents good half-inch steel plate. CARD cars have whipped these tough conditions for many of the major ore producers of the western hemisphere.

Familiar names like these and many others dot the C. S. CARD customer lists over and over with their repeat orders. CARD cars built to order for these firms cost little more than standard stock models, yet they result in large savings because they are built to handle specific mining requirements.

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safety awards from the National Safety Council on July 29. The Hibbing crushing plant's award was for operating since 1949 — 443,471 man-hours — without a disabling injury. The Monroe open pit mine was recognized for its record of 808,094 accident free man-hours in 1953.

MONTANA

Geiger counter tests in an old prospect tunnel on the True Fissure property in Mineral County north of DeBorgia show the presence of strong radioactivity which apparently exists in radon gas, the source of which has not yet been determined. The property, owned by Guido Bardelli of Osburn, Ida., was tested by Dr. F. E. Scott, well-known Wallace, Ida., mining man. Plans are to reopen portions of the old workings now inaccessible because of cave-ins in order to make further tests for the source of the radioactive gases in the tunnel.

Two old properties in Mineral County are now under development by Saxon Mining Co., a new Idaho corporation headed by C. D. Nelson of Spokane. At the Keith prospect near St. Regis, where Nelson found evidence of radioactivity last year, the area above an old tunnel has been bulldozed, exposing a vein of uranium-bearing ore. The ore, however, is not as good as that found on the dump of the old tunnel, and a crosscut to gain depth on the structure is now in progress.

At the old Deadwood mine between St. Regis and Superior, a one-half mile access road is being built to facilitate further development of a narrow lead-silver vein exposed by bulldozer. The structure assayed 20% lead, 10 oz of silver and 1% copper to the ton, officials said.

Exploration of the Black Cap property in Boundary County, Ida., near Naples, will be undertaken at a later date. These claims also have a uranium showing.

The company expects to finance its exploration and development programs through the sale of 200,000 shares of its capital stock at 25c a share.

Nancy Hanks Mines Inc. has been organized in Montana by Wallace and Kellogg, Ida., interests to undertake further development of the old Nancy Hanks Mine in Granite County near Garnet under a 10-yr lease and option.

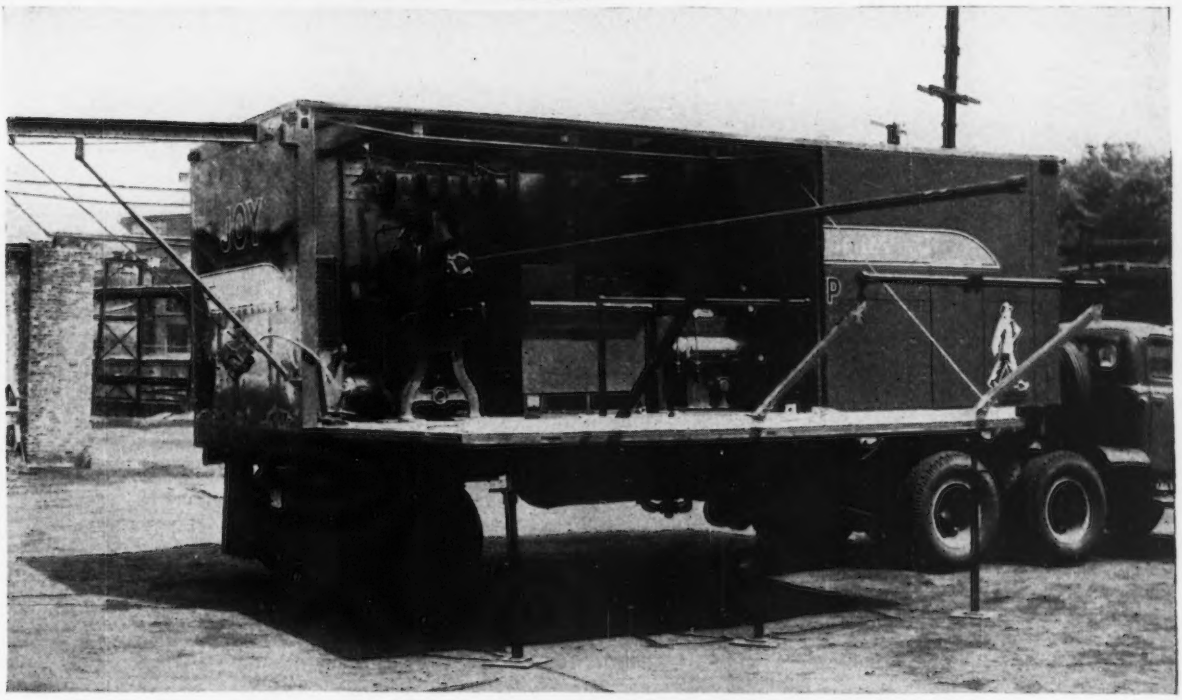
Rehabilitation of the old 510-ft incline shaft and underground workings has been started and arrangements are being made to lease a milling plant about ¾-mi from the mine. John Reinart of Portland is president; W. L. Henderson, Spokane, is secretary-treasurer.

Golden Anchor Mining & Milling Co. is installing a new crushing and grinding unit at its milling plant at Treasure Mountan near Helena, according to H. L. Newmiller, Spokane, president. Some 25,000 to 30,000 tons of milling ore containing gold, silver, lead and zinc is "in sight" in the mine, he reported.

Uranium Exploration of Houston, Texas, headed by V. B. Nelson, is engaged in

MOBILE SHOP FACILITATES DEEP-HOLE DRILLING. Operated by Joy Manufacturing Company, this tractor-trailer unit services Bethlehem 2-in.-Round Hollow used in drilling 4½-in.-diam holes.

UPSETTER IN ACTION. This upsetting machine can forge a 3⅛-in.-round upset on the 2-in. drill steel in 12 seconds. Shop uses three sources of power—air, electricity and water.



Mobile Unit Reconditions Special 2-in.-Round Bethlehem Hollow

This huge shop on wheels is one of a growing fleet of mobile units operated by Joy Manufacturing Company, Pittsburgh, Pa. The unit, serving an area covering hundreds of square miles, was designed for the reconditioning of 2-in.-round hollow drill steel, a drill steel specially developed for use with the Joy Challenger Drill.

The Challenger Drill, with its 5¼-in. bore, is capable of drilling 4½-in.-diameter holes through hard rock to depths of 50 ft or more. It has a 26-ft feed, and a self-propelled mounting. But because customers did not have the facilities to recondition the drill steel used with this huge drill, it was decided to render a highly specialized type of field service, which would minimize lost time, and reduce transportation costs.

The truck is amply stocked with service parts, and is staffed by men who know the answers pertaining to deep-hole drilling. Included in its equipment are heavy-duty sharpeners, grinders, induction heating for forging and treating, and a radiator type of air cooler to cool the quenching oil. It uses three sources of power—air, electricity and water.

The Bethlehem 2-in.-Round Hollow Drill Steel used with the Challenger Drill has a standard carbon analysis and is an outstanding steel for deep-hole drilling because of its toughness and long service life. This fatigue-resisting steel, available in large sizes, permits maximum rock removal with fewer holes. It comes in 22-ft and 32-ft lengths, and has a ¾-in. center hole which is smooth and true. The steel can be easily forged and heat-treated, and has a wide quenching range.

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BETHLEHEM STEEL

an intensive search for uranium on a 30,000-acre tract of leased land in the Three Forks of Montana. The exploration program, started in March, included a magnetic survey of the entire tract.

Polaris Mining Co. has encountered rich silver-copper ore in its east exploration lateral from the 3000-ft level of the Silver Summit Mine. The new orebody, which showed 91.6 oz of silver and 3.1% copper in initial assays, is believed to be the downward extension of the chimney-like ore shoot which yielded about $100,000 worth of ore when mined by Coeur d'Alene Mines Corp. from above its 2800-ft level.

It is in the extralateral rights area of American Silver Mining Co., one of the parties to the eight-party agreement under which Polaris is carrying on the project with the aid of a 50% DMEA loan.

Plans are to raise on the ore to connect with the 2800 level workings to provide ventilation and a second escapeway from the lateral which will eventually be extended more than a mile farther eastward into Rainbow Mining and Milling Co. property.

Minerals Engineering Co., Beaverhead County, is producing about 550 tons of tungsten ore per day on a 6-day week basis, according to R. N. Roby, mine superintendent. The company is milling about 440 tons daily on a 7-day week basis.

Concentrates are shipped to the Salt Lake Tungsten Refinery at Salt Lake City. Minerals Engineering Co. has a financial interest in the Salt Lake Tungsten Refinery.

NEVADA

Diamond drilling, mapping and exploration are in progress at the Westvaco uranium property south of Austin. Boyles Bros. of Salt Lake City are in charge of the drilling operations. The property was recently leased from Joe Lundberg, of Austin, and field headquarters have been set up in that town. W. A. Young, of Pocatello, Idaho, is project engineer, and W. C. Peters, also of Pocatello, is geologist.

Hogle Brothers, of Salt Lake City, are developing a new mineral deposit 27 mi from Eureka in the Fish Creek Ranch area. The deposit is complex, the predominant mineral being nickel. Manganese and zinc also show good values, and the mine will be known as the Niganz.

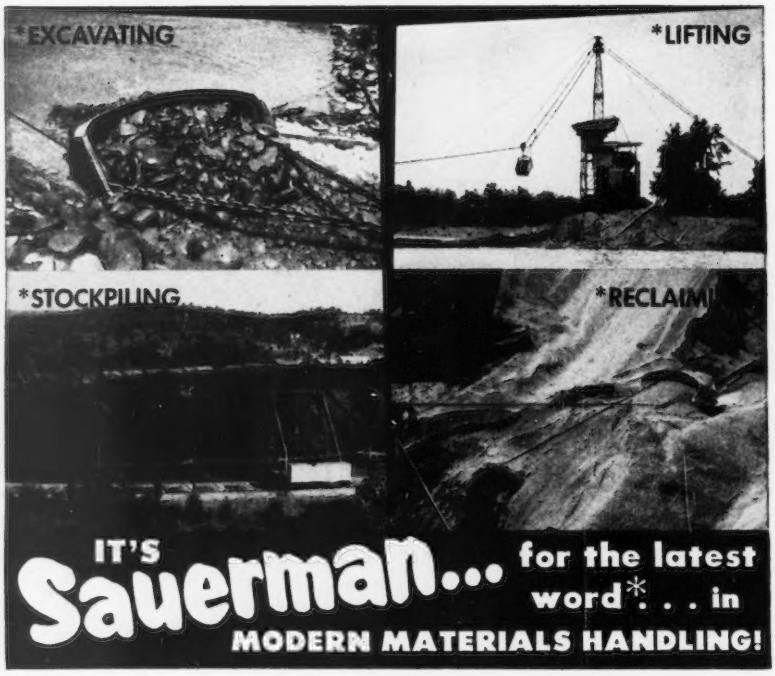
Equipment has been moved to the site and an inclined shaft will be sunk to determine the extent and grade of the ore. Roger Caywood, of Eureka, is superintendent of the mine development, and Sherman B. Hinckley, of Salt Lake City, is in overall charge of the operation.

Magnet Cove Barium Corp. of Houston, Tex., has increased the production of barium at the Greystone group of claims 33 mi south of Battle Mountain. Barium is being hauled a distance of 42 mi to a crushing plant at Beowawe and shipped from there to California for refining.

Shipments are presently two cars daily, and that is expected to increase soon. The pit from which the ore is being taken has a 40-ft face of high grade barium and has 75 ft to go to reach the hanging wall. The footwall is about 1000 ft below, making a deposit known to be more than 1000 ft wide and 3000 ft long. The company plans to put a mill at the mine site or at the railroad shipping point this fall, at which time another pit 2000 ft to the west of the present development will be opened.

Al St. Claire, of Los Angeles, and Harry F. Sunnvale, of Salt Lake City, are operating a mercury mine in the Antelope District near Lovelock. A compressor house and compressor have been set up and the cinnabar is being treated by retort tubes. Their property adjoins the site of the Red Bird mine formerly operated by Harold's Club, of Reno.

A new mill went into operation during July on the Leonard Creek placer property of the Eureka Hamburg Mining Co. Extensive development has been under way on the site which is located 85 mi northeast of Winnemucca. Hal C. Skeels is president and consulting engineer.



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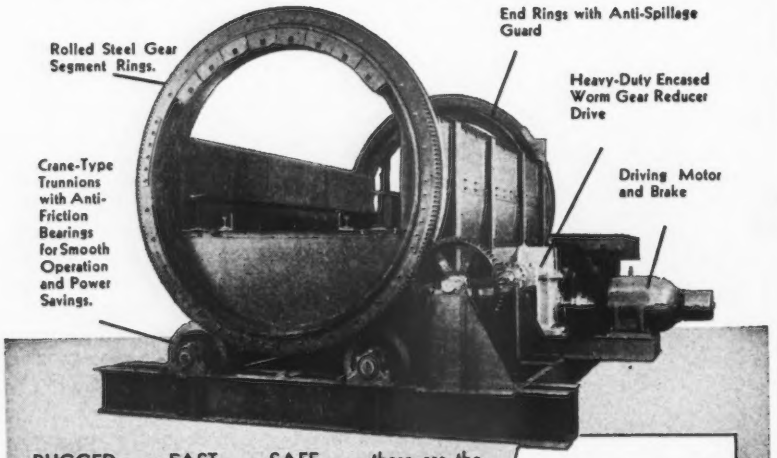
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Nevada Massachusetts Co. has stepped up its daily production of tungsten ores to 500 tons at its plant at Tungsten in Pershing County. Ore from open pit mining is being treated at the rate of 125 tons per day and is mixed with 375 tons of high grade ore mined from depth. The operation is one of the nation's largest and has been producing for 37 years.

Some Mexican manganese ore is being treated at the Caselton plant of Combined Metals Reduction Co. in Lincoln County. During July, 3500 tons of the foreign ore was received at Caselton where it was treated and then sent to the Pioche Manganese plant at Henderson for further refining. It was the first in a series of intermittent shipments which will be worked cooperatively by Combined Metals Reduction Co. and Pioche Manganese.

Open pit mining of fluorspar is going on in the Humboldt Range near Imlay where Benny Dennison, of Reno, and Henry Schwabrow, of Lovelock, are working a deposit on 11 claims in the Fluorine Group. A No. 19 tractor and bulldozer is removing the overburden and building a flat to be used as a construction site for a mill. The mill to be installed will produce 60% purity by crushing and screening, and the ore will then be sent to the Kaiser plant at Fallon for further refining.

Cordero Mining Co. plans to maintain its current production rate of 300-350 flasks of quicksilver a month at Cordero mine 80 mi north of Winnemucca in Humboldt County, according to J. Eldon Gilbert, company manager. A 100-ft shaft was put in two years ago, and present workings are at level 7.

Copeland & Knight have reactivated two mills on the Comstock near Silver City, and both are now in operation handling low grade ore running from $7 to $15 per ton in values. The Donovan Mill is processing 100 tons of ore per day which is furnished from the Woodville Justice mine adjoining the mill on the north. The Dayton mill is processing ore from the Peach claim just over the line in Lyon County. Both properties have been leased by the Copeland-Knight interests. A crew of 30 men is employed, and the Donovan mill has been working on a 24-hour basis. Both are cyanide mills. The Copeland & Knight interests conducted the Eagle-Picher diatomaceous earth mining operations at Clark Station until recently. Tom Copeland, of Reno, is in charge of the enterprises.

NEW MEXICO

Nearly 200,000 acres of Acoma Pueblo tribal lands soon may be opened for uranium exploration. Dewey Dismuke, United Pueblo Agency official, said in Albuquerque that the Pueblo Council has decided to advertise for public bidding for a permit to prospect for uranium and associated minerals.

Dismuke said also that the Zuni and

How far *was* Thirty Paces?

NOBODY knows, exactly. Back in the days of meetings on the "field of honor" neither the distances nor the weapons were very accurate. Land and buildings were sometimes "paced off" and even some phases of engineering followed the rule of thumb.

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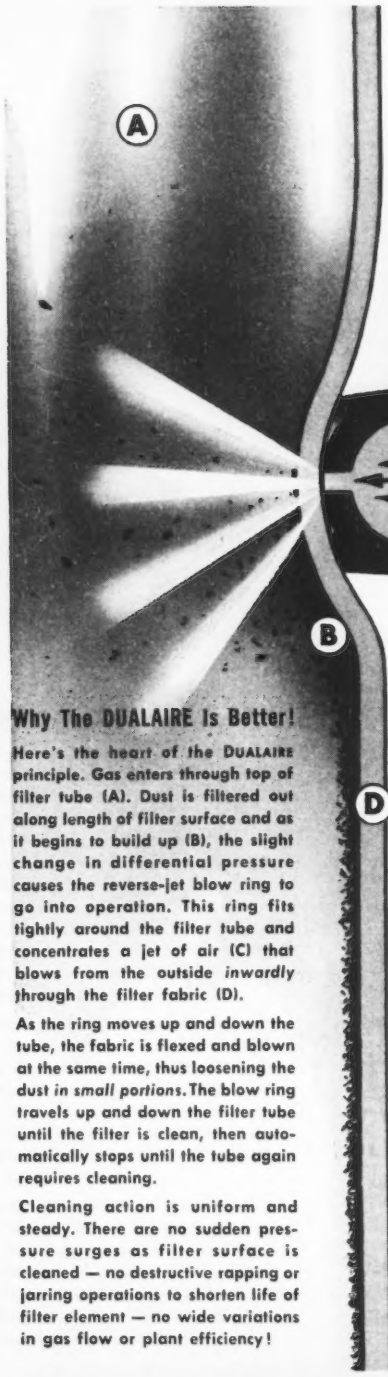

No pressure surges!
No filter choking!
Efficiencies up to 99.99%!

Why The DUALAIRE Is Better!

Here's the heart of the DUALAIRE principle. Gas enters through top of filter tube (A). Dust is filtered out along length of filter surface and as it begins to build up (B), the slight change in differential pressure causes the reverse-jet blow ring to go into operation. This ring fits tightly around the filter tube and concentrates a jet of air (C) that blows from the outside *inwardly* through the filter fabric (D).

As the ring moves up and down the tube, the fabric is flexed and blown at the same time, thus loosening the dust *in small portions*. The blow ring travels up and down the filter tube until the filter is clean, then automatically stops until the tube again requires cleaning.

Cleaning action is uniform and steady. There are no sudden pressure surges as filter surface is cleaned — no destructive rapping or jarring operations to shorten life of filter element — no wide variations in gas flow or plant efficiency!

If you use bag-houses or other similar collecting systems in your plant operations, be sure to investigate the *many* vital advantages built into Western Precipitation's new DUALAIRE Dust Collectors. Backed by the same well-known organization that pioneered commercial application of COTTRELL Electrical Precipitators and MULTICLONE Mechanical Collectors, DUALAIRES bring entirely new performance and efficiency standards to filter-type collection systems.

As outlined at the left, heart of the DUALAIRE is a reverse-jet blow ring that travels up and down the cloth filter tube, keeping it clean without the alternate choking and pressure surges characteristic of conventional rapping, vibrating, or jarring systems of cleaning off the collected dust. *Result*—

▶ **UNIFORMLY LOW PRESSURE DROP** is assured, because the collected dust is removed steadily and in small increments — not by sudden surges!

▶ **UNIFORMLY HIGH EFFICIENCIES** — as high as 99.99% under actual field conditions — are maintained by the constantly-cleaned filter surfaces. There is no "choking" action — no variation in filter efficiency as dust accumulates!

▶ **LONGER FILTER LIFE** is obtained because the filter fabric is not subjected to destructive jarring, rapping and vibration of conventional filter cleaning methods. The Dualaire cleaning action is gentle — yet far more effective!

▶ **LESS EQUIPMENT IS REQUIRED** to handle a given capacity with the Dualaire because no standby sections need be provided for gas cleaning while other sections are shut off for rapping. The Dualaire filter is kept constantly clean — automatically — while it is filtering out the suspensions. The gas is filtered and the dust removed simultaneously — without interruption. Saves space, simplifies installation!

▶ **MAXIMUM ADAPTABILITY** to varying installation requirements is assured by the "sectionalized" design of the Dualaire. Each section is available in 5 different heights — and as many sections can be bolted together as desired to meet plant requirements. As needs increase, simply add more sections!

▶ **EFFICIENT STRAIGHT-THRU DESIGN** of filter tubes assures easier dust recovery, better flow. Dirty gas enters top of tube, is filtered through the walls, and dust drops by gravity through bottom of tube into collection chamber. Separated material does not re-entrain in the gas flow.

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There are many other advantages built into the DUALAIRE. *For further details send for this descriptive 12 page booklet. Or contact your nearest Western Precipitation representative!*

*"Dualaire" & "Multiclone" ®

Licensed by H. J. Hersey, Jr.

Isleta Pueblos and the Mescalero and Ute tribes also are considering seeking bids for mineral exploration permits.

Anaconda Copper Mining Co. is mining uranium ore on the Laguna Pueblo property (*E&MJ*, August 1954, p 96).

Calumet & Hecla reportedly has signed an agreement with Canoncito Uranium Corp. under which C&H will initiate a $300,000 uranium prospecting and core-drilling program on Indian land in northwestern New Mexico.

John Lynes, of Albuquerque, Canoncito president, said that the agreement calls for C&H to begin the prospecting and core-drilling program immediately on 16,000 acres on the Canoncito Navajo Reservation. (For other news of Calumet & Hecla, see Wisconsin news, this issue).

New Mexico Bureau of Mines & Mineral Resources **and the New Mexico Institute** of Mining & Technology, Socorro, have announced issuance of a detailed report on the Grants uranium area in the northwestern part of the state.

Dr. Eugene Calaghan, bureau director, said that the 40-page report contains the first detailed information on the Grants discoveries to be released for unrestricted distribution.

Entitled "Geology of the Thoreau Quadrangle, Valencia and McKinley Counties, N. M.," the report was written by Dr. Clay T. Smith, head of NMIMT's geology department. Research was shared by NMIMT and California Institute of Technology.

The report is accompanied by a 3-color map, 21x27 in., showing all formations which show promise as potential uranium deposits.

Tower Milling & Mining Co.'s new manganese mill at Truth or Consequences now has completed several weeks of successful operation.

OREGON

Harvey Aluminum Co. has successfully developed processes for treating Salem bauxite at its experimental plant at Salem after several months of research.

It is believed that alumina can be produced from the Oregon material and the company is going ahead with plans for building a pilot plant and believes that later it will build a larger plant somewhere in the same district.

The Harvey company paid the Government $325,000 for its Salem plant which had been built during the last war. A. W. Metzger is in charge of the work for Harvey.

NEW JERSEY

New Jersey Zinc Co. has announced plans to end its century-old mining operations about Oct. 1 at Franklin. Lindsay F. Johnson, assistant to the company president, explained that ore had run out and that the company had exhausted exploration possibilities.

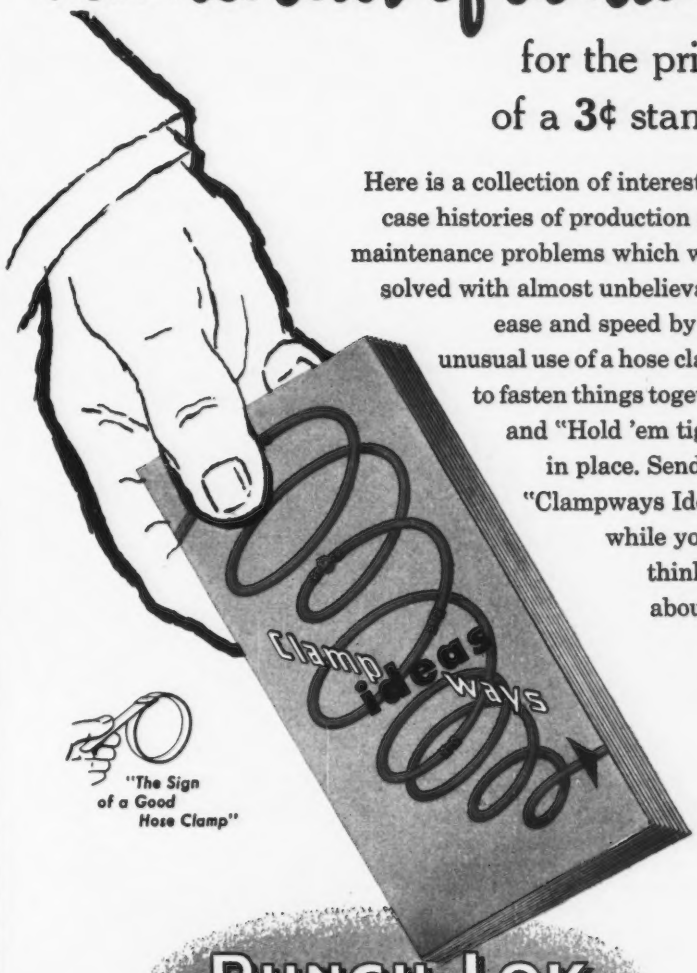
Some 400 workers at the Franklin

ideas...worth

hundreds of dollars

for the price of a 3¢ stamp

Here is a collection of interesting case histories of production and maintenance problems which were solved with almost unbelievable ease and speed by the unusual use of a hose clamp to fasten things together and "Hold 'em tight" in place. Send for "Clampways Ideas" while you're thinking about it.*



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Mine will be affected. Many, however, will be transferred to the firm's Sterling Mine at nearby Ogdensburg. The Ogdensburg property is being modernized and a new ore-crushing mill is being built. Several of the Franklin buildings will be sold.

Both the Sterling and the Franklin mines began operating about 1848 and were New Jersey Zinc's first properties.

The loss of ore production from the Franklin Mine will be offset by production of new mines now in the process of development (in Pennsylvania, Tennessee and Virginia) and by increased output from mines already in operation.

PENNSYLVANIA

First uranium mine in the eastern United States is now in production. Lehigh Coal & Navigation Co. miners have been blasting and mucking since July at the mine near Jim Thorpe (formerly Mauch Chunk) on the edge of the Pocono Mountains.

An adit has been driven into the side of a cliff to reach the orebody which is imbedded in Pottsville conglomerate. The conglomerate includes carnotite and a substance resembling pitchblende. It is located in the base of the coal measures at the edge of the coal fields.

AEC has reached agreement with Lehigh for all uranium produced. Because there are no uranium mills in the eastern United States, AEC will for the time being stockpile the ore.

Occurrence of carnotite in this region has been known since the late 1800's. United States Geological Survey in the late 1940's took a closer look at the carnotite and found it interesting. The Pottsville conglomerate is found in various stretches of the Appalachian coalfields.

UTAH

Idaho Maryland Mines Corp. has revealed details of a recently-completed leasing agreement covering 1160 acres of school land 20 mi southeast of Moab.

Lease stipulates that 12% of gross profits from the mine must be paid as royalty to the state. The property, Idaho-Maryland's only Utah holding, reportedly is near Charles Steen's Mi Vida mine.

Bert C. Austin, Idaho-Maryland president, said only surface observation has been made of the uranium prospect, which is divided into three separate parcels. A drilling contract is to be let soon.

Securities Exchange Commission has opened a Salt Lake City branch office, with the avowed purpose of keeping a close eye on uranium stock issuance practices.

Meanwhile, the Utah Securities Commission has warned brokers that underwriting fees for new uranium issues must not exceed 12½% of funds obtained from the public. The total includes all other fees and interests which the underwriters may obtain for their services, the commission noted.

Lavender Uranium Co. has contracted with Glen B. Cash, Monticello, for 150 ft of drift work in the Indian Creek District of San Juan County. Lavender has likewise signed contracts for 5000 ft of diamond drilling with the Moki Uranium Syndicate for exploration on its claims. The drift will follow surface discoveries of uranium ore in the Shinarump conglomerate.

WISCONSIN

Calumet & Hecla Inc. announced Aug. 9 that it had sold its zinc-lead mine at Shullsburg to Eagle-Picher Co. Purchase price was not disclosed.

The Shullsburg orebodies were discovered in 1947 by Calumet & Hecla geologists and the mine has been worked commercially by the company since 1951. Output has been at the rate of about 1200 tons a month.

T. Spencer Shore, Eagle-Picher president, said in Cincinnati that the purchase included lease-holds on about 3650 acres as well as a mill, supplies and materials.

In Chicago, Endicott R. Lovell, Calumet & Hecla president, commented that

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13 reorders on Vulcan slusher hoists since 1935

The Vulcan Iron Works Company, Denver, started working with the Climax Molybdenum Co. in 1934 to develop special slusher hoists which would best meet the requirements of their mining procedures. Since that time Climax has placed 13 orders for a total of 92 Vulcan Slushers: 85, 150 h.p. and 7, 50 h.p.—the most recent order, now in production, is for 5, 150 h.p. double drum tandem slushers and 7, 50 h.p. double drum single shaft slushers.

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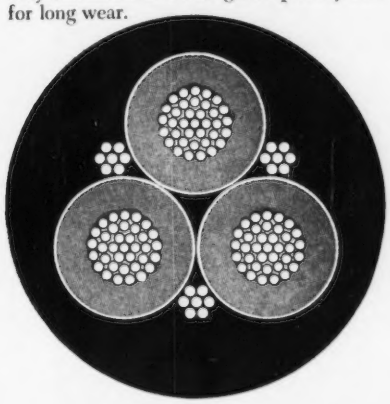

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CON-TRAK-TOR
FULL LUG

US RUBBER UNITED STATES RUBBER COMPANY

the sale was in accordance with his firm's long-range program for converting some of its assets to provide working capital for more profitable use in other operations. (For other Calumet & Hecla news, see New Mexico news, this month.)

WASHINGTON

Conconully Mines Inc., hopes to bring the Mohawk property in north central part of state into operation by mid-September. About 100 tons of silver-lead-zinc ore will be mined and milled monthly, according to A. E. Kaiser, manager of Conconully Mines.

The firm has leased American Graphite Co.'s concentrating plant near Omak, Wash., and used low-grade ore from the Peacock Mine in shakedown work at the plant. Kaiser said the Peacock development showed promising higher grade ore with up to 11% copper content.

IN CANADA

ONTARIO

A new shaft is nearing completion at McKenzie Red Lake Gold Mines, veteran Red Lake gold producer. Going to an inclined depth of 2200 ft, the new opening will permit the establishment of four new levels, the first to be opened in 15 yr. The mine's efficiency will be increased, too, since present hoisting is a three-stage operation. Completion of the project is scheduled for late 1954.

New Dickenson Mines, also in Red Lake, is deepening its main shaft by 1050 ft, to provide for seven additional levels below the eighth, now the mine's deepest. Meanwhile, production is running at record levels, exceeding $1-million in the first six months of the year. The mill is treating in excess of 400 tons daily compared with an average of 344 tons in 1953, and average recovery has been fractionally higher.

There's expansion news, too, from New Dickenson's neighbor, the Dome-controlled Campbell Red Lake mine. Mill enlargement (500 to 600 tons) is being effected this month, with a goal of 750 tons set for a later date.

Mine development, which has always been kept well ahead of mill requirements, is also being stepped up, installation of enlarged hoisting equipment making it possible to start lateral work on the seven new levels recently established from the deepened main shaft. First work on these levels, incidentally, has given excellent results; a new orebody intersected by flat drilling on the 9th, 10th, and 14th levels showing values far above mine average in grade.

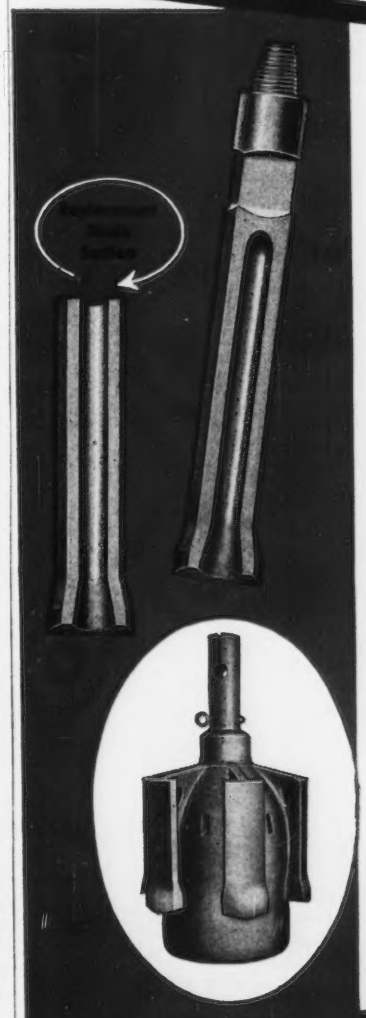
June production was the best yet for East Rim Nickel Mines, nickel-copper producer on the east flank of the Sudbury basin, some 20 mi northeast of Sudbury. Output from 17,559 tons was approximately 330,000 lb of nickel and 126,000 lb of copper with net value $150,000. Further increase is probable, too; the mill can handle 700 tons daily, compared with June's average of 585 tons, and will be stepped up to capacity in the early fall. Eventual aim, dependent on the results of an expanded development program now being started, is 1000 tons daily.

Blind River, the uranium area which featured Ontario exploration in 1953, has moved up to the underground development stage. Two major shaft jobs are in progress and a third is being considered.

Pronto Uranium Mines, developing the area's discovery property, has sights set on production with initial milling capacity of 1000 tons daily. Latest report from surface drilling, made prior to institution of the security regulations which affect all properties past the early prospect stage, showed 2.5-million tons indicated with average grade about 0.13% U_3O_8.

A three-compartment shaft has been started from which five levels will be opened at 100-ft intervals. If all goes as planned, start of production will be

SPANG



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reached late in 1955, it was estimated.

Algom Uranium Mines has two prospects. Main bet is its Quirke Lake ground, with 6.4-million tons indicated to a slope depth (the conglomerate beds are flat-dipping) of 910 ft, with average grade 0.11% U_3O_8; in addition, a good drill hole has cut the zone at a slope depth of 3500 ft.

A five-compartment shaft is being put down, with seven levels to be established at 100-ft intervals, and plans are being made for a milling plant that will have capacity of 3000 tons daily.

Algom's second prospect is its Nordic Lake group, where drilling indicates 2.3-million tons to a slope depth of 400 ft with average grade 0.124% U_3O_8. Deeper drilling will be done before plans for underground development are finalized.

Many other companies are active in the Blind River area, most of them still in the surface prospecting stage. Among the latest to acquire ground are Belfast Mines, busy exploring a 42-claim group tying on to the north of Algom's Quirke Lake ground; Temple Gold Mines, with 45 claims in the Pecors Lake sector; and New Jersey Zinc Exploration Co. (Canada) Ltd., with an option on a big group made up of the holdings of Calder-Bousquet Gold Mines, Big Game Mines, Gui-Por Uranium Mine & Metals, and Moon Lake Uranium Mines.

Consolidated Mosher Mines reports that developments to date are satisfactory on the second level being opened on its property adjoining MacLeod - Cockshutt Gold Mines on the west in the Little Long Lac area.

After some preliminary troubles the apparent downward and westerly rake of the ore from the first level has been established. The two levels are deep (1740 and 2040 ft) since the orebody is the westerly and downward extension of the "F" orebody which is now MacLeod-Cockshutt's main ore source.

Deep drilling at Kerr-Addison Gold Mines, the Larder Lake producer that holds undisputed place as Canada's biggest gold mine, continues to show sparkling results. A score of holes put down below the present bottom level at 3700 ft to determine the best layout for the next level at 3850 ft have given excellent results. The best one gave the most impressive core ever pulled in the mine's long history; 102 ft that averaged 1.235 oz gold per ton.

The 3700-ft level, now pretty well developed, shows 7774 tons per vertical ft averaging 0.67 oz per ton.

Kerr-Addison has started construction of a roaster, made necessary by tendency of the mine's ore to become more refractory with depth. To be completed next February, with cost $1-million, the unit will treat 130 tons of concentrates daily.

Geco Mines, feature prospect of the Manitouwadge area (see *E&MJ*, July 1954, p 116) has become one of the Noranda group, arrangements for financing to the extent of $7.5-million having been made with a group of Noranda subsidiaries and affiliates headed by Mining Corporation of Canada. Operating management has been placed in the hands of Mining Corp., which already manages Quemont, Normetal, and Torbrit Silver Mines.

Aunor Gold Mines, Noranda subsidiary in the Porcupine gold camp, has completed the long drive on its 2900-ft level to the boundary of the adjoining Delnite property.

Completion paves the way for opening the 800-ft block of ground that lies undeveloped above that horizon for a length of 3700 ft. Only work of importance done in the block was on the 2500-ft level, which was opened from the Delnite workings before the Aunor shaft was deepened; work there showed a length of 1236 ft averaging 0.36 oz gold per ton across average width of 10 ft.

A new diamond drilling program has been started by South Giroux Mines, Ventures subsidiary in the Cobalt silver camp. The company's original work, done four years ago, gave erratic results, and the new work is being done on a different part of the property in search of the extension of good showings found on the adjoining claims, privately held.

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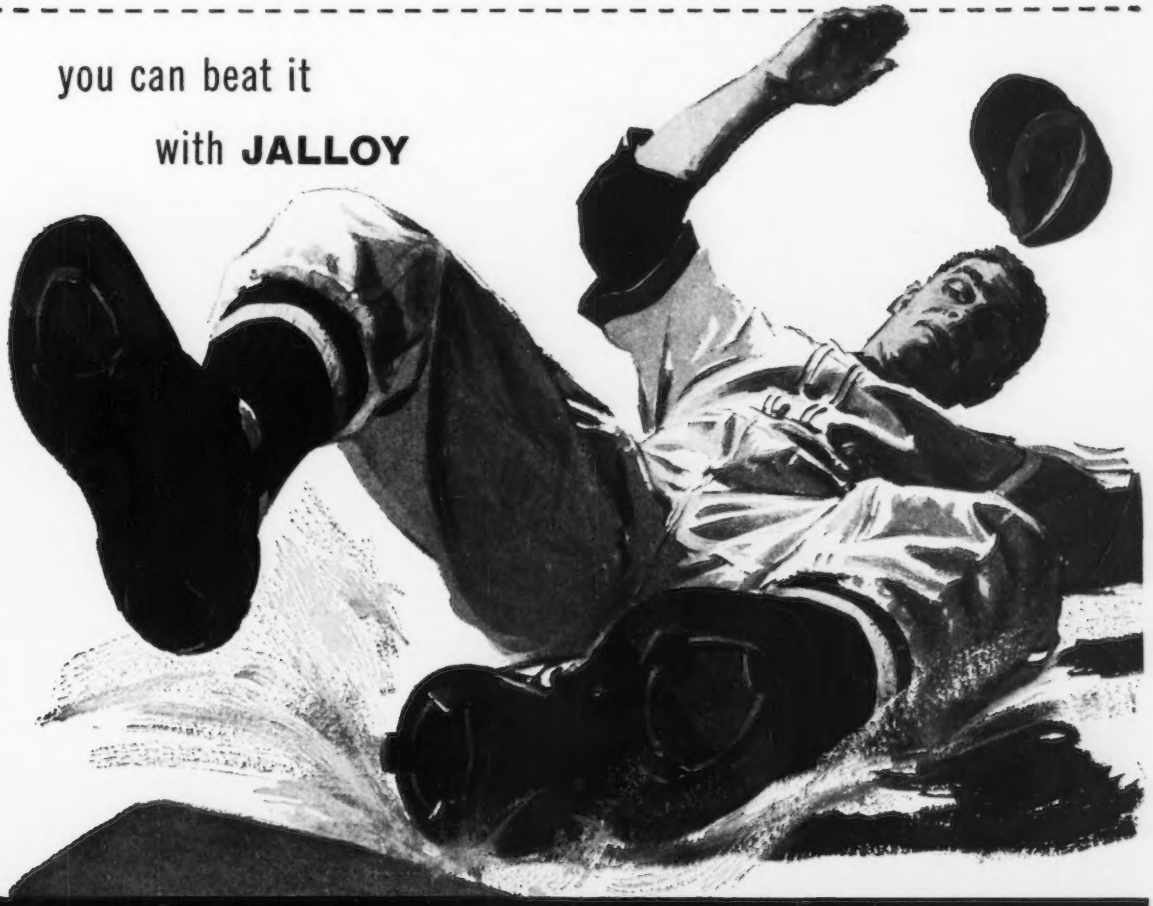

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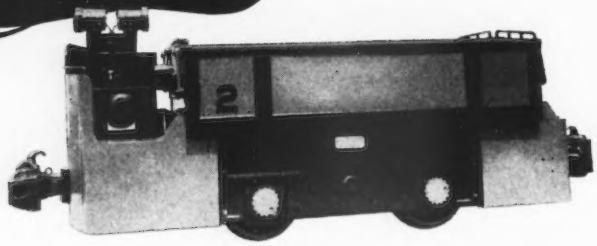

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Centre Lake Uranium Mines, developing its uranium prospect in Eastern Ontario's Bancroft area, has completed some 500 ft of lateral work on the level established from the recently completed shaft at a depth of 240 ft.

Results are stated to be well up to expectations, comparing well with those secured on the first (or adit) level. Surface drilling indicated 1-million tons to the 500-ft horizon; grade is not high, but the management believes that a sales contract can be arranged with Ottawa at a price sufficiently above the minimum to assure profitable mining, it was reported.

QUEBEC

Barnat Mines, growing gold producer of the Malartic camp, is well along with its shaft deepening program, having carried the opening well below 1800 ft on its way to the 2350-ft horizon. Completion, slated for early winter, will make ground available for six new levels below the present bottom level at 1425 ft.

Profitable operations have been well established by Quebec Copper Corp., new copper producer in Brome Co., Eastern Townships. The mill is now operating regularly at its 750-ton capacity rate, and in June the mine's output was in excess of 750,000 lb of copper. The management estimates ore reserves as sufficient for well over five years' milling down to the 1600-ft horizon. The mine's deepest level at present is at 1150 ft.

A new copper showing is reported by Portage Island (Chibougamau) Mines on its property in the Chibougamau district's Roy Twp. Surface trenching designed to test the possibilities shown by a geophysical anomaly disclosed a heavily mineralized gossan zone which has been traced for 400 ft with width in excess of 50 ft. First detailed work showed grade of 1-2% copper over mineable widths, and an enlarged program of exploration has been started, it was reported.

Surface drilling is in progress on the 400-acre zinc-copper prospect in Barraute Twp. being explored by Absam Mines. Encouraging mineralization over good widths is reported.

Quebec Asbestos Corp. reportedly has discovered a new major orebody 3 mi northeast of its East Broughton operation, 15 mi northeast of Thetford Mines, Que. Preliminary estimates place the new find at upwards of 40-million tons of commercial-fiber, all of which can be won by open-pit techniques.

General Engineering Co. reportedly has been engaged to prepare cost estimates of a plant and other production facilities. One sources said that a plant of 2000 tons daily capacity could be expected.

E. A. Boadway, general manager, began a program of intensive exploration several years ago. The new mine will be known as the Carey Mine, named after the parent organization, the Philip Carey Manufacturing Co. of Cincinnati.

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BRITISH COLUMBIA

Dr. W. B. Burnett, president of Cariboo Gold Quartz Mining Co., a B.C. firm, has disclosed a tentative deal by the company to purchase Island Mountain mine, subsidiary of Newmont Mining Corp. of New York. Price has been estimated unofficially at $1-million to $2-million.

The agreement is subject to approval of shareholders of Island Mountain.

Should the deal go through, it will be the reversal of expectations, as mining men had predicted the New York group would take over Cariboo.

Completion of the agreement would mean the B. C. company would acquire ready-made underground approaches to its own orebodies. Island Mountain shafts go down 1500 ft, compared to Cariboo's 500 ft, and right up to the face of Cariboo's best ore at depth.

Cariboo's claims enclose Island Mountain on three sides, and the surface workings of the two mines face each other across Jack of Clubs Lake, about 60 mi from Quesnel on the Pacific Great Eastern Railway.

Operational costs of Island Mountain, because of increasing depth of its working, had been steadily mounting, and the company had announced that the mine would be closed before long.

Dr. Burnett explained that Island Mountain ore would be trucked over to the Cariboo mill, which recently has been handling about 200 tons per day. In previous years it had been handling up to 370 tons daily.

He added that ore extraction cost will be slashed for Cariboo because the new access at a depth of around 900 ft below the bottom of Cariboo's present working will permit mining in an upward direction.

Burnett stated that the deal is a straight cash offer. It will give the B.C. firm virtually all the assets of Island Mountain except the powerhouse and mill, which duplicate Cariboo's existing facilities.

Giant Mascot Mine Ltd. reports that the extension to the three-compartment shaft started on May 17 reached the 8-level on June 15. A station is being cut at the new level and first work will be the driving of a 150-ft crosscut in preparation for mining operation.

The advancing of a drift at a new elevation has been established by the Noland Mines Ltd. at Atlin, and existence of the post-tertiary channel has been placed on the old line of strike.

J. D. Mason, vice president, has announced that plans are under way for expansion of the deep-lead placer operation on Spruce Creek near Atlin. He reports engineering studies give every reason to expect the channel to continue, as diamond drilling by former operators traced the tertiary river bed for 2 mi.

Northern Gold Dredging Co. Ltd. has purchased a suction dredge capable of mining 50 cu yd of gravel per hour. This was to be moved from its present location in California to the Fraser River property and was expected to be in operation by Aug. 15, with a crew of six men under the direction of the president, Martin Retan.

The company holds leases covering 4½ mi of the main channel and benches of the Fraser River, a half-mile upstream from Big Bar and 52 mi northwest of Clinton. It is reported that tested operations carried on over the past year have yielded high assays with pan recoveries grading from 70c to $85 per cu yd.

Operations have begun by Copper Ridge Silver Zinc Mines Ltd. on a copper property with good nickel showings located in the Britain River area at Jervis Inlet.

The company has a fully equipped crew under management of Transcontinental Resources Ltd. at the property proceeding with systematic trenching and sampling.

Silver Standard Mines announced that it is pushing development at its New Hazelton property in the northwest area of the province.

Two crosscuts were advancing at the rate of about 250 ft a month. One was expected to reach its objective (the No. 1 vein indicated by diamond drilling) by

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the end of August, the other its objective (the No. 11 or Black Prince vein also diamond drilled) by the end of November.

A promising new vein of gold has been discovered at Pioneer Gold Mines property in the Bridge River area. The company reports that in drifting to the north during development work a hanging wall vein was found branching off from the 27 vein a short distance north of the shaft on the 27, 28 and 29 levels.

The branch vein reportedly showed values of 0.58 oz of gold a ton on the 27 level and 0.70 on the 28 level.

American Metal Co. Ltd. of New York will start operations immediately to bring the Canam Copper Co. Ltd. mine near Hope into production. The agreement with American Metal calls for expenditures up to $5-million, if after exploration, American Metal decides to maintain its interest. The deal, unanimously approved at a meeting of shareholders, changes the former agreement with the Consolidated Mining & Smelting Co. of Canada. Under the new agreement Cominco is to receive 10% of the authorized stock of Canam Copper, placing it on the same basis as all other shareholders.

American Metal agrees to start work at once and is reported to have made a commitment to spend $300,000 at the outset if exploration warrants. The company's engineers are already in B. C. The company agrees to proceed continuously with its development program until the mill is in operation or until $5-million has been spent, provided exploration justifies continued participation.

NORTHWEST TERRITORIES

A photo-mapping mission north of the Arctic Circle was completed late in August by Spartan Air Services Ltd., Ottawa. Forty men had been assigned to this mission, including electronic engineers from Spartan's affiliate company, Canadian Aero Service Ltd.

American Yellowknife Mines Ltd. is undergoing a capital reorganization to provide additional funds for development of its mining and oil holdings in the Northwest Territories and western Canada, according to a report from Toronto. Company's name will be changed to Rayrock Mines Ltd.

MANITOBA

Hudson Bay Mining & Smelting announced that mining and milling operations at its Cuprus Mine probably would cease before the end of August. Development work has failed to locate new ore. No definite plans have been made regarding disposal of the 300-ton concentrator and other assets.

Main development of the property located 13 mi southeast of Flin Flon began in 1947. The 300-ton concen-

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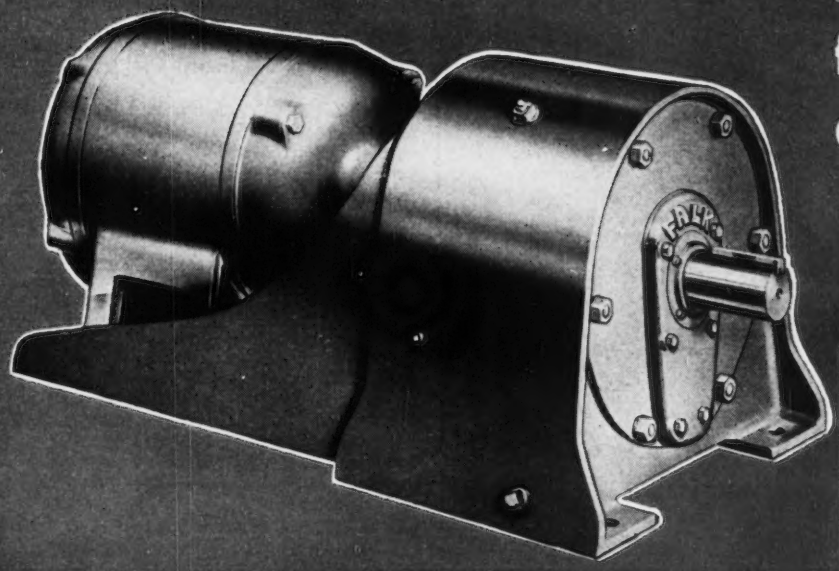

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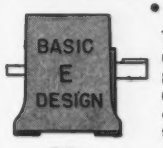

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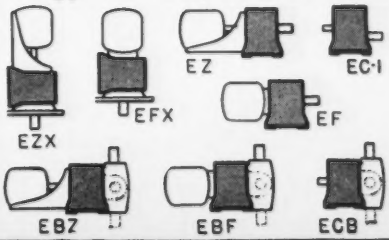
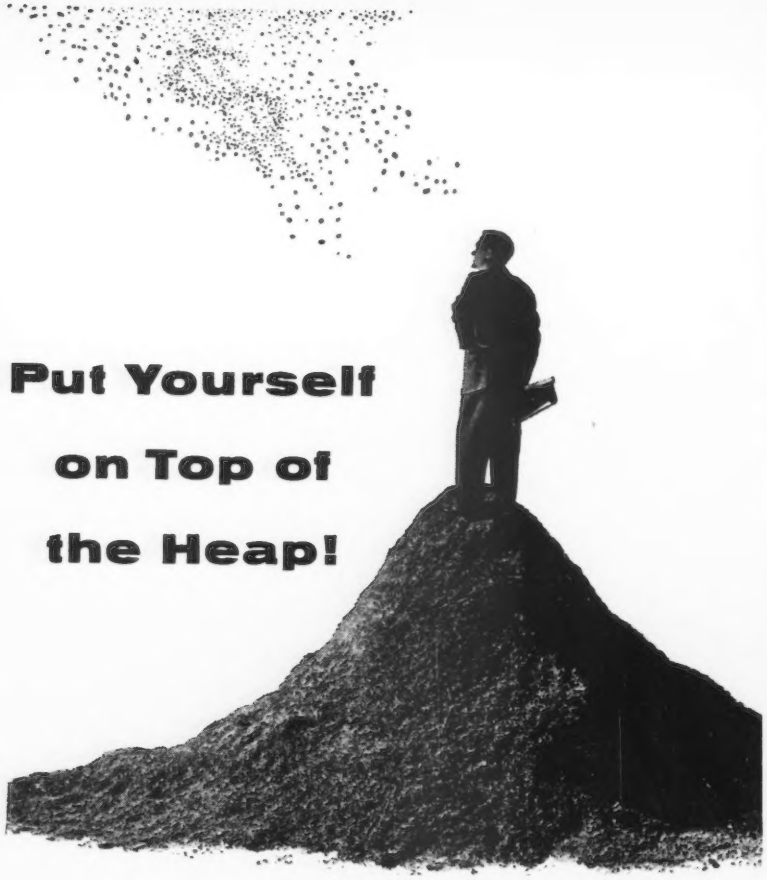


WRITE FOR BULLETIN 3104



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trator started production in October 1948 at an initial rate of 150 tons, increasing to 250 tons in 1949. All zinc and copper concentrates were trucked to Flin Flon.

Hudson Bay is now completing a 13-mi road to its Coronation mine southwest of Flin Flon. Diamond drilling to the 600 ft horizon on this property has indicated 545,000 tons of ore, reportedly grading 5.37% copper, 0.59% zinc and low values in gold and silver.

San Antonio Gold Mines Ltd. reports a general improvement of conditions, with labor being in ample supply, permitting an increase in exploration and development work.

On the 23rd level a drive into the subsidiary property (Forty-Four Mines) is within 1000 ft of the fine ore area developed on the 26th level. Production from the Forty-Four property is expected before the end of 1954.

San Antonio also is active in the Blind River uranium area of Ontario where it holds an 80-claim prospect. A diamond drill program is planned, with Jeep Gold Mines taking a 20% interest.

Sherritt Gordon Mines Ltd. reported that actual production of nickel should begin by end of August. Operations at the Lynn Lake mine have shown that recovery and concentrate grade are better than originally intimated to the shareholders. Milling rate continues at 1900 to 2000 tons a day. A new crusher will be installed at the mine next month which will easily supply the full capacity of the mill.

Lithium Corp. of America Inc. has taken over the lithium property of Northern Chemicals Ltd. in the Cat Lake area. Previous development work consisted mainly of surface trenching and diamond drilling. No plans regarding future development have been announced.

ALBERTA

A thorough investigation of iron ore deposits in the Peace River area is expected soon as a result of preliminary surveys which indicate an "appreciable tonnage of iron containing materials."

The Alberta and Northwest Chamber of Mines and Resources said although the actual depth of overburden has not been determined in detail, experts believe that there is a large tonnage near the surface and within 30 mi of the railway.

The grade reportedly is low, but it is believed likely that the ore could be concentrated. Natural gas in the area would be utilized in the process.

Iron prospecting permits were issued by the Alberta department of mines and minerals last spring in the Hines Creek area, a terminal point on the Northern Alberta Railways on the north side of the Peace River.

A permit for prospecting on 99,840 acres in that area was issued in March to a Calgary geophysicist, Bruce McDougall, after showings of iron ore deposits were found in oil drilling operations.

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SASKATCHEWAN

A contract has been let for the sinking of 220 ft of vertical shaft at the Pat group of National Explorations Ltd. in the Beaverlodge district, O. S. Lampman, president and managing director, announced.

Contractors were in Vancouver, B. C., purchasing machinery and equipment, he said, and it was hoped to complete the sinking and cutting of stations at the 100-ft horizons within two months of the start of sinking.

Shaft-sinking operations are under way on the uranium property of Lorado Uranium Mines Ltd. in the Beaverlodge area. Shaft will be sunk to a depth of 235 ft to investigate a drill-indicated ore zone. At the 225-ft horizon, a station will be cut and 1000 ft of lateral work will be undertaken.

Menifee Uranium Mines Ltd. plans 5000 ft of diamond drilling on its 19-claim prospect in the Charlot Lake sector of Northern Saskatchewan. About $6000 has been expended so far on exploration work, which includes geiger counter surveys, trenching and sampling of several radioactive areas. Values to date have ranged from $7 to $16 per ton in uranium oxide across good width, the company reports.

YUKON

Six dredges are now at work in the Dawson area, according to a report from the Yukon Consolidated Gold Corp. Ltd. Production during the first month of operation, which started early in May, was estimated at $98,000.

Northwest Ventures Ltd. reports a crew is working on claims close to the recent discovery of Prospectors Airways on Pelly River. Samples of ore have been forwarded to Vancouver, B. C., for assay. The company was formed originally to develop a group of claims north of the Granduc copper property near Stewart, B. C. It is expected that exploration of these claims will get under way this summer.

IN LATIN AMERICA

MEXICO

Not only mining circles but all sectors of Mexican business and economy are breathing easier now that President Eisenhower has rejected recommendations for increased tariffs on lead and zinc imports (See p 132).

The chairman of the Mexican Senate committee on mining, Alberto Terrones Benitez, earlier suggested that Mexico, Peru and Canada unite in their effort to bring pressure to bear to avoid the boost on zinc and lead tariffs.

Terrones Benitez stated that it is obvi-

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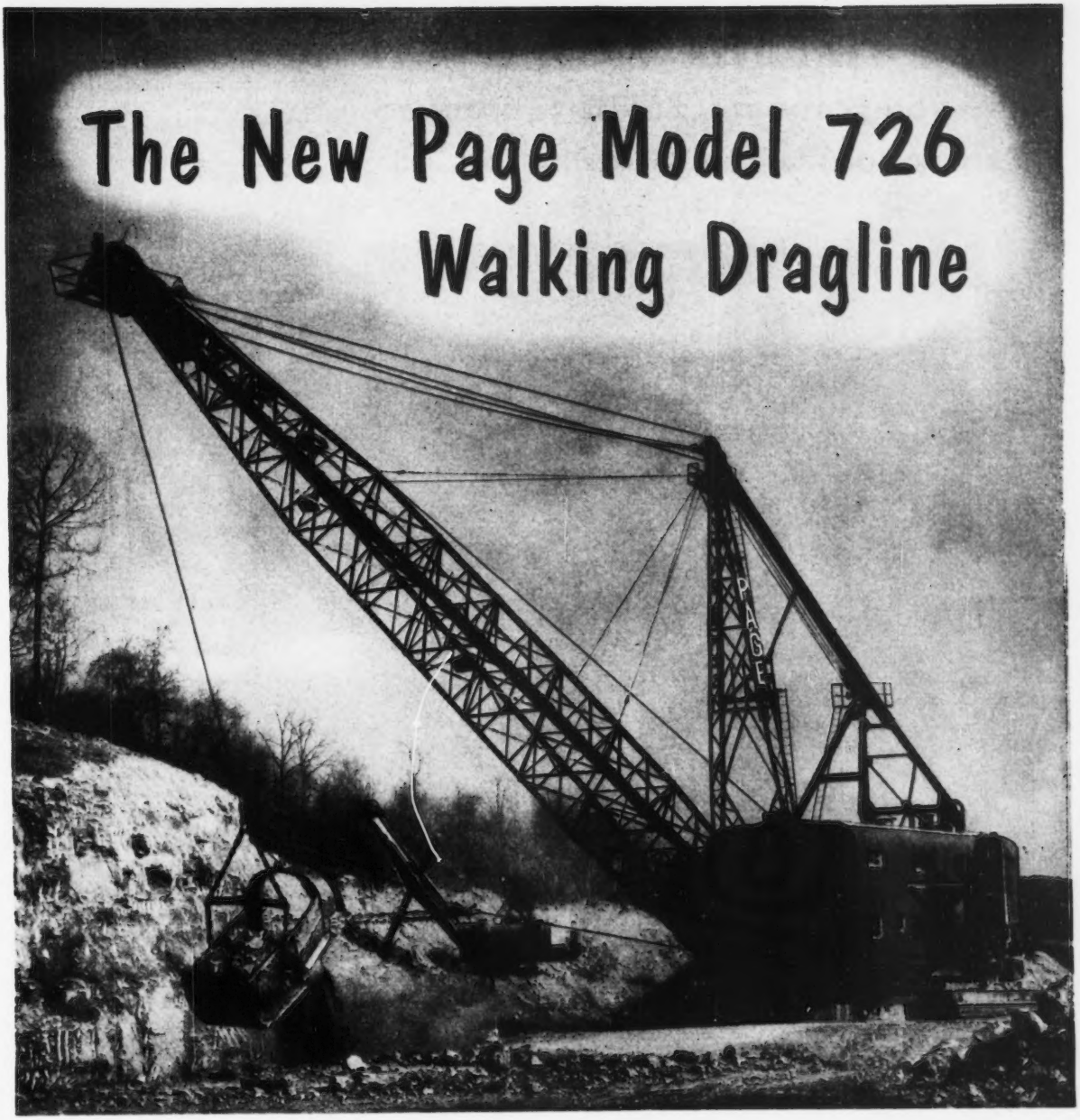

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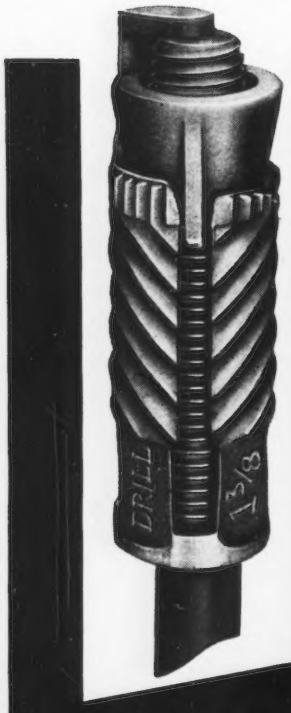

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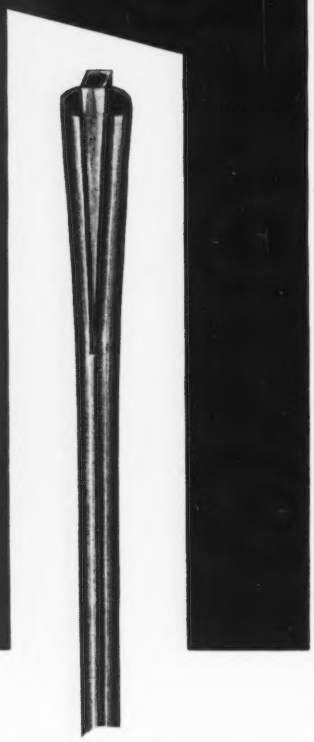

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Service-proven West Virginia roof bolts mean fewer mine accidents and a faster mining cycle. Get increased headroom and storage space, faster movement of men, machinery and coal.

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ous that the United States does not need to stockpile the lead and zinc, and that ordinary protection of the American lead and zinc producers would be natural, but that Mexico hoped to convince the American legislators that such a tariff increase should be avoided on the basis of friendship between the two countries and continental solidarity.

According to some Mexican mining experts, such a tariff increase would be disastrous to the Mexican mining industry. By far the largest bulk of Mexican mineral exports, and a pillar of the country's economy, is lead and zinc. These alone have kept Mexico's balance of trade with the U. S. on an even keel over many years. Without them, most economists concede, Mexico would suffer a disastrous disbalance of trade between the two countries.

The executive secretary of the Mexican Mining Chamber of Commerce, Jose Campillo, has gone so far as to state in published information that it is his opinion that most of Mexico's mines would have to close if such a tariff increase were carried out.

The Mexican newspaper *Excelsior*, the most prominent and respected in the Mexican capital, had run two editorials about the matter which it regards as of paramount importance to the country.

In the meantime, Mexico's ambassador in Washington, Manuel Tello, had been able to present to President Eisenhower personally the petition that the zinc and lead tariffs be not increased.

Mexico's foreign trade is in no position to suffer further reverses, such as the possible loss of its lead and zinc market. Official trade statistics show that Mexico exported 1,050-million pesos less of goods in the first five months of this year than for the comparable five months of the previous year.

Mineral production is down all along the line in Mexico with the exception of zinc which had a slight increase over last year, according to Ministry of Economy figures.

Gold production this year is down from a monthly average of 38,234 troy oz last year to only 32,493 this year; silver production is down from a monthly average of 4.09-million troy oz last year to 3.28-million troy oz this year; copper is down from a monthly average of 5012 metric tons last year to 4984 metric tons average this year; lead is down slightly from average monthly production last year of 18,749 to 18,459 this year; zinc is up slightly over last year's monthly average of 18,240 metric tons to an average of 18,724 metric tons average so far this year.

BRITISH GUIANA

Spartan Air Services Ltd., Ottawa, early in August began photo-mapping a 38,000 sq mi area of Central British Guiana and the nearby island of Santa Lucia. Two PV-1 Venturas are to be used in the survey. Flying at 15,000 ft, the planes are expected to take three months of favorable weather to complete the mission.

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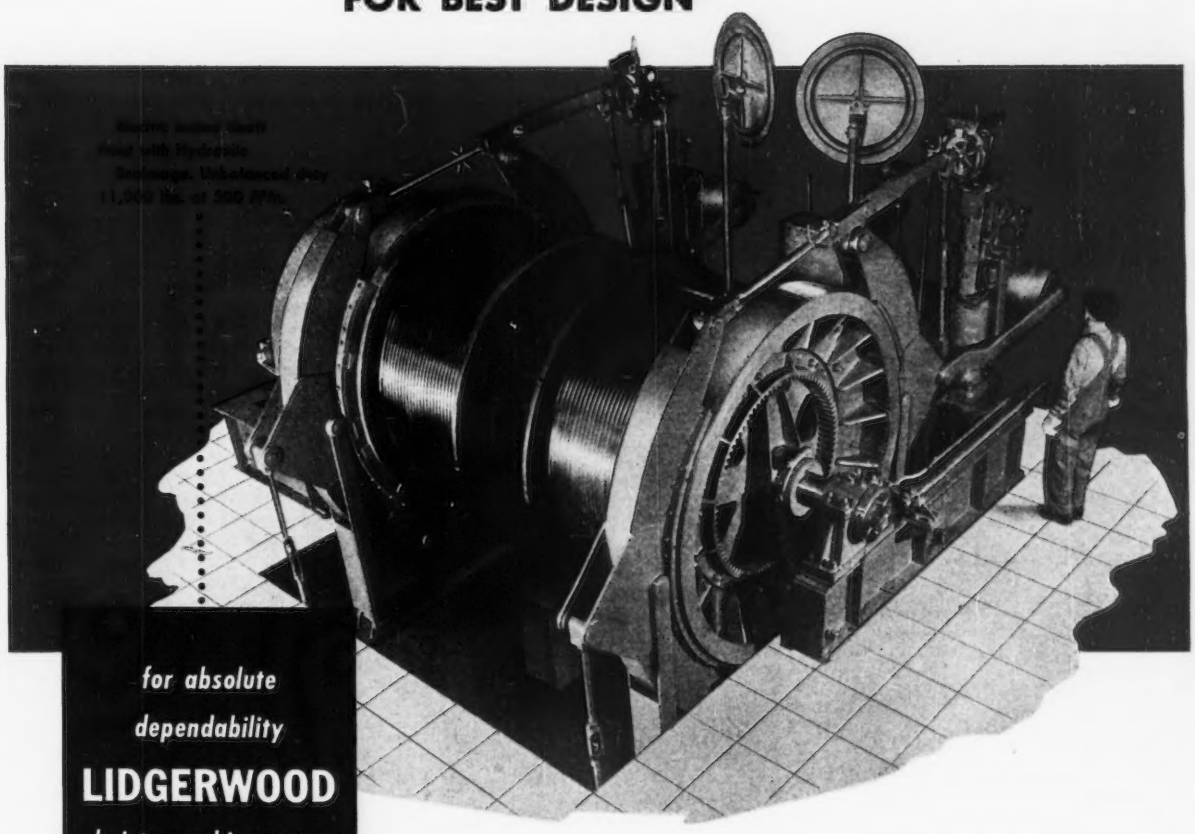

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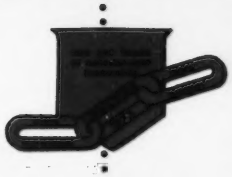

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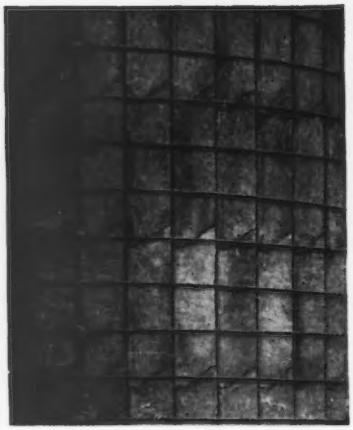

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VENEZUELA

Compania Minera Botanamo C. A.'s old Botanamo Mine in the dense jungle of eastern Venezuela is preparing a mining and milling operation on a 40-ton-a-day basis. This production will be reached early this fall.

The mine had been one of Venezuela's most profitable gold mines; it boasted a nine-year continuous operating period on better than 1 oz mill heads. Present developments are the result of an exploration program started by Noranda in 1949 in the Botanamo district. A series of new veins have since been opened. Robert Bottome, Caracas financier, is president of the Botanamo firm. Robert W. Hume is general manager.

Extensive gold concessions in eastern Venezuela's El Callao district, formerly held by Frobisher interests under Guayana Mines Ltd., is now being operated by Minas de Oro de El Callao.

A plan is in successful operation whereby the major part of the ore supply, currently about 500 tons a day, is furnished by individual contractors or leasers who work with technical guidance and stores advanced by the company.

Ore is purchased on a sliding schedule from both company-owned and private concessions within trucking distance of the company's mill at El Peru. About 600 men are now engaged in actual mining or prospecting in the district and a community of 5000 is supported.

New road construction and the growing importance of Venezuela's iron resources has stimulated mining activity throughout this country.

CUBA

A copper and zinc smelting plant has begun operation near the Los Cerros Mine in the municipal district of Fomento, Las Villas, according to reports from Havana.

The smelter is designed to process 70 tons of ore daily in three 8-hr shifts. Plant is owned by Compania Industrial Minera Los Cerros, S. A., shares of which are held by some 200 Cuban investors.

Two Cuban engineers, Jose Elortegui and Enrique Ruiz Williams Jr., set up the smelter. E. J. Meaust, of Western Machinery Co., San Francisco, acted in a temporary advisory capacity.

Pedro Muniz, manager, mining department of the industrial division of the Bank for Agricultural & Industrial Development, said that ore reserves currently proved amount to 23,000 tons. Much larger reserves are indicated.

The mine had been operated previously but never with success, reportedly because the unsmelted ore did not bring sufficient returns. It is hoped that the newly-added smelter will tip the scales in favor of profit.

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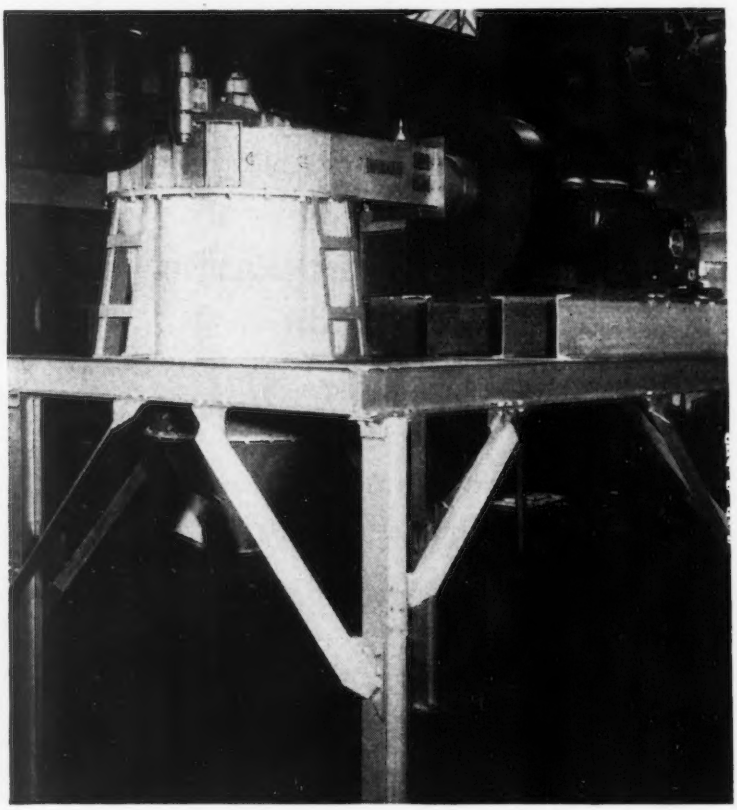

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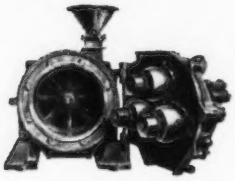

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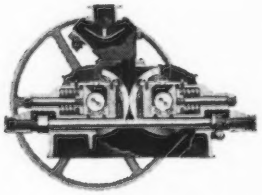

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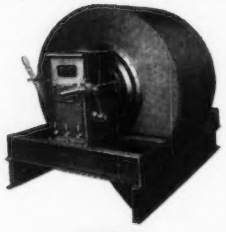

BLENDER
Four-way mixing action assures a thoroughly blended product. Open-door accessibility permits easy cleaning. Available in many mixing capacities for ¼-ton per hour and up.

York and Havana, have been selected to construct expansion facilities at the U. S. Government's nickel plant at Nicaro in the Province of Oriente. The selection was made by the operating contractor, National Lead Co. General Service Administration is responsible for both the operation and expansion of the nickel plant (see *E&MJ*, June 1954, p 81).

CHILE

Compania Minera de Tocopilla, one of the oldest medium-size copper mining companies in Chile, is driving a tunnel 1¼ mi long in order to save some 1800 ft of hoisting through inclined shafts whose present condition does not permit fast hoisting.

Though the tunnel will not get to the bottom of the mines, it will considerably improve conditions for getting the ore to the mill both as regard cost and time.

The Ministry of Mines has not yet found a satisfactory formula for helping the medium size mines that have to deliver all of their dollar exchange to the Foreign Exchange Commission at the official rate of 110 pesos to the dollar. One such formula, propounded by the miners, would be to allow the companies to liquidate the greater part of their dollars as at present to 110 pesos per dollar and the rest at the free rate according to how this is quoted at the Stock Exchange, which now is around 310 pesos to the dollar.

This solution would permit the medium size copper companies to meet the higher cost of mining and milling due to increased wages and supplies.

Charles M. Brinckerhoff, general manager of Chile Exploration Co. in a recent visit to Santiago said at a press conference that both Chile and Andes will maintain the 6-day work-week; that the company is producing now at the rate of 32-million lb of copper a month and that if the bill sent to Congress by the Administration is approved it will cut costs at Chile by 4½c a lb.

Fluor Co., of Los Angeles, has made a proposition to the government for installing a sulphur processing plant at the port of Arica. The proposition reportedly was made through Bernard Branson and C. W. Courand, Commercial Attaches of the United States Embassies at Lima and Santiago respectively. There are many good sulphur deposits near the volcanoes located in the Cordillera back of the Arica port but their distance from the sea is appreciable.

An agreement probably will be reached with the United States for prospecting for uranium minerals in northern Chile as soon as the bill sent to Congress dealing with radioactive minerals becomes law, according to the Under Secretary of Mines.

At a special meeting of the Copper Committee of the Central Bank which was attended by the Minister of Mines and by delegates of the three U.S. Copper

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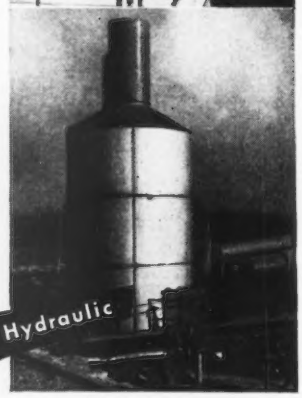

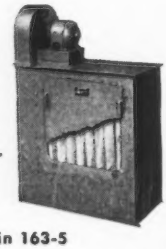

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Companies, it was agreed that production would be increased until a level of 360,000 metric tons of copper per year would be reached for the three companies.

Chilean production of copper for the first four months of 1954 was 109,052 metric tons compared with 159,936 tons for the same period in 1953. Because of this and other decreases in Chilean exports, it has been estimated that the country will be short of 150-million dollars this year.

BRAZIL

Following resumption early this year of operations at the Camaquã copper mine in the state of Rio Grande do Sul, the ore is being produced at a rate of 7200 tons of concentrate per year, representing close to 2200 tons of refined copper, approximately one-tenth of domestic consumption.

In the months of February, March, and April, 170 tons of concentrate were produced, with a copper content of 34%. The mines in the area were closed at the end of World War II when the copper price dropped to an uneconomical mining level. Recent price increases prompted reopening of the Camaquã mine, with help from Banco do Brasil.

A 65% manganese content and 68.30% iron content in Amapá minerals has been reported following analization by the Laboratório de Análises of the Territory of Amapá. In addition, ore with a chromite content of 55% (average) is reported. In another area of the Territory iron ore with a 52.56% content has been reported.

A ship was expected to dock soon at the port of Macapá with 600 tons of tractors, motors, and varied equipment for construction of the railroad which will lead to the Amapá manganese area. The railroad is being constructed by Foley Bros., of the U. S.

To step up its search for uranium and thorium (Tório), the Departamento Nacional da Produção Mineral has received Cr$ 15-million (US$750,000) following indications of new deposits of those minerals. Work under way includes investigation of the following areas: part of the Rio Ribeira valley, between Paraná and São Paulo, for discovery of uranium minerals and nonferrous ores, particularly lead and zinc; an area of 42,000 square kilometers in the states of Paraiba, Rio Grande do Norte, and Ceará, or beryllium, tantalite, uranium, thorium, and scheelite.

PERU

Cerro de Pasco Corp. has staked claims on 5984 hectares of land containing copper ores in the Yarabamba District and an additional 2800 hectares in the Quequena District in the Province of Arequipa, 16 mi southeast of the city of Arequipa.

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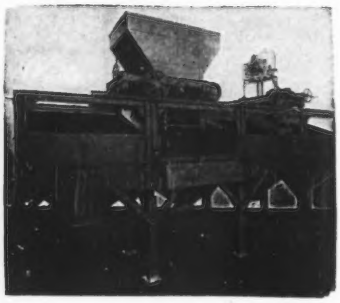

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Test drilling is underway at San Jose in the Yarabamba District where Cerro de Pasco has been exploring for the past two years. Drilling is under the supervision of A. J. Terrones, assistant chief geologist in charge of the exploration division. A 10-mi access truck-road to San Jose is under construction.

Some 170 delegates gathered in Lima recently for the first convention of the Peruvian Metallurgical Engineers association. In an opening address, Mario Samané Boggio, president of the Institute of Mining Engineers, gave a statistical picture of Peruvian mining today.

At the present time, Samané said, there are operating in Peru 53 flotation plants, 4 smelters, 2 gravimetric concentrators, 8 cyaniding plants, 3 density separators, 2 pyrometallurgic plants, 4 coal washing plants, 2 cement factories, one salt refinery and one nitrate plant.

As of last Dec. 21, these plants employed 6270 men with a payroll of U. S. $2.2-million a year and had a daily capacity of 13,000 tons of ore.

New concentration plant at Pasto Bueno Mine, near Pallasca, Department of Ancash, is now in operation. Pasto Bueno is said to contain one of the world's richest known deposits of tungsten.

Capacity of the new concentration plant is 250 tons daily. The new plant was formally dedicated July 21. That day marked also the 80th birthday of Fermín Malaga Santolalla, president of Malaga Santolalla é Hijos, Lima, owner of the Pasto Bueno property.

Beginning last month, all concentrates were being shipped directly to the port of Salaverry, near Trujillo. This eliminates the necessity of shipping to a plant near Callao, the practice heretofore.

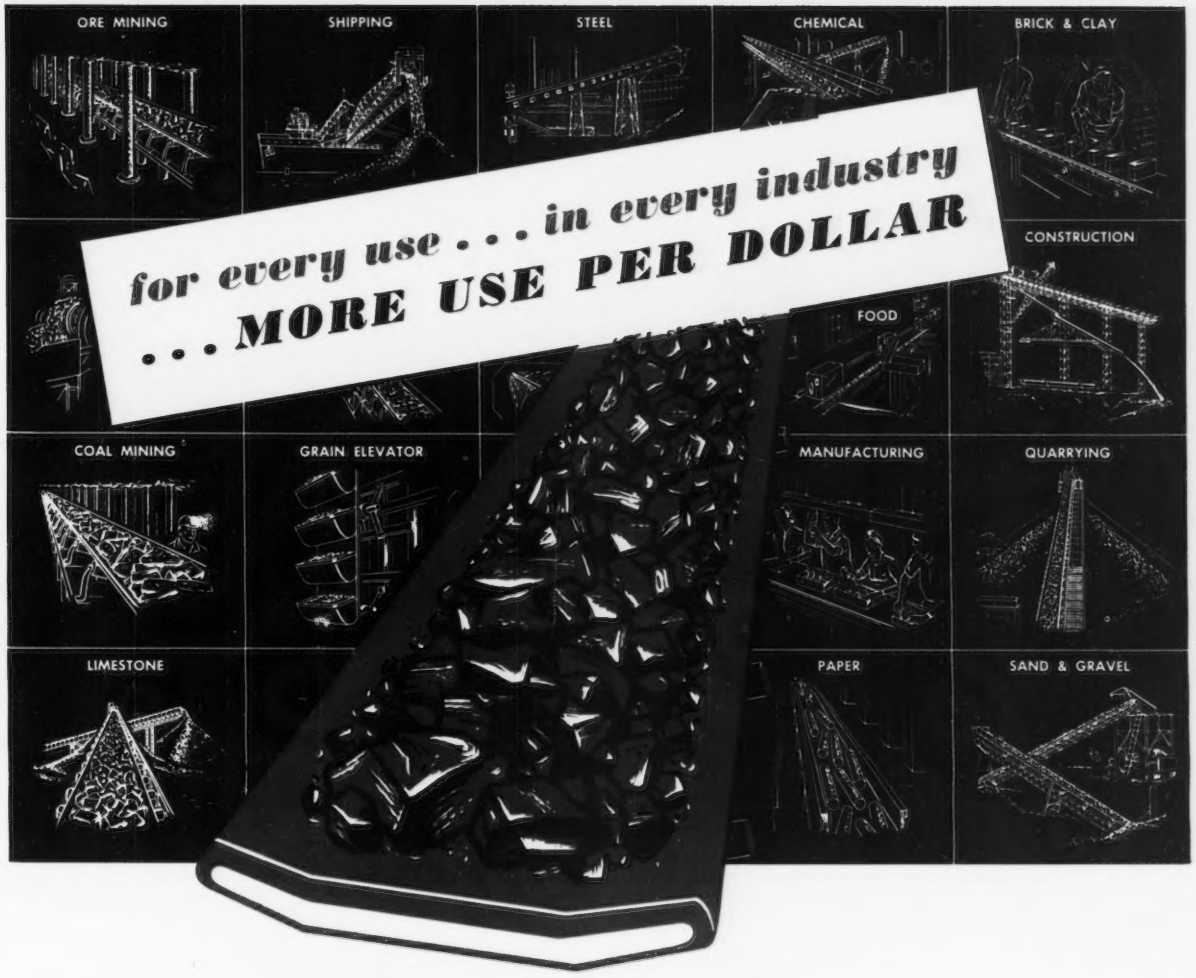
The new concentrator employs a gravity process. In addition, flotation is used to separate sulphides found in some of the ores. Tungsten content is boosted from 40% to 70% so that the concentrate may be shipped directly to the United States.

Only production of Tamboras, a mine about 41 mi from Pasto Bueno, is continuing to ship to a concentration plant at Callao, where flotation and magnetic separation is used.

In July 1951, the Export-Import Bank authorized a US$650,000 loan to assist in financing development of the Pasto Bueno Mine. The loan was used for machinery and equipment, for construction of a hydro-electric power plant and for construction of a 50-mi highway. Total development costs are estimated at US$1.5-million.

The loan contract provided that all tungsten produced between Jan. 1, 1952, and June 30, 1958, would be sold to the U. S. Emergency Procurement Service. Amortization of the loan started from the beginning of 1954. It is hoped that the loan may be repaid in full by the end of 1955.

Some 1000 men are now employed at Pasto Bueno, some of whom are engaged in construction of a new hospital. Camp construction was completed in June. At Tambora, 250 men are employed, it was reported.



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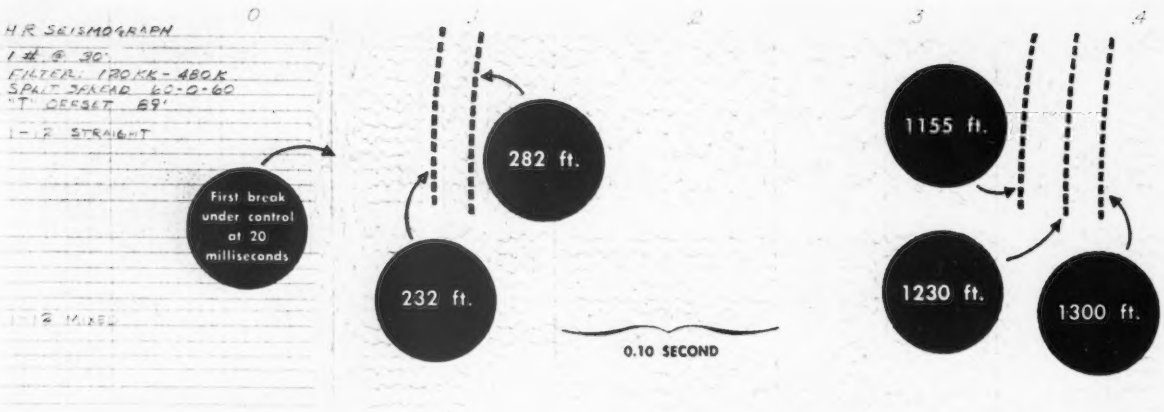

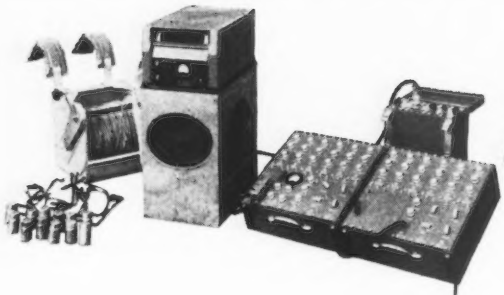

High Resolution

here's a new record for near-surface seismic data

If you're plagued with the problem of obtaining accurate near-surface seismic data, look carefully at the record illustrated here. With first breaks under control in 20 milliseconds, a reliable reflection was obtained at a depth of 232 feet. This record is typical of the results obtained by the new Houston Technical Laboratories High Resolution Seismic System. A major development in geophysical prospecting, the HTL portable HR System now makes possible reliable reflection surveys over a depth range of 100-2500 feet. It is especially designed for use in petroleum exploration, mining, ground water location, and civil engineering where shallow seismic information is vital.

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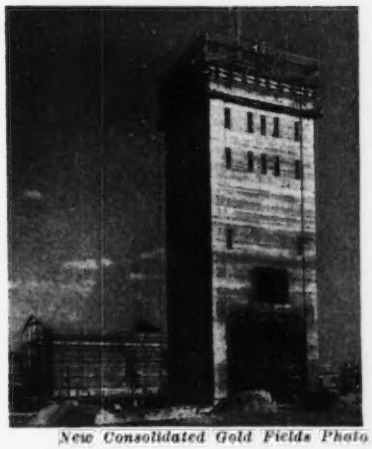

New Consolidated Gold Fields Photo

West Driefontein's new winder tower

Concrete towers are replacing the old conventional lattice-work headgears in the new goldfields of South Africa. Newest is at No. 5 shaft, West Driefontein, on the Far West Rand. Here for the first time on the Rand the electric winder is on top of the tower. Floor of the winder house will be 178 ft above ground level; top of the head frame will be 203 ft above ground.

Two Koepe Winders—used for the first time on the Rand—will operate a rock hoist using 15 tons bottom discharge skips, with four-rope attachments, and two-rope service cages for men and material.

In addition, the shaft will be served by a two-drum Ward Leonard winder conventionally housed at ground level. Depth of the shaft is 5200 ft.

A uranium field which will make it possible for France to supply "all her needs in nuclear power materials" reportedly has been discovered in Madagascar. The deposit is in the south-east of the island in the Beara and Esira regions, not far from Fort Dauphin.

Promising deposits of pyrochlore have been found in Tanganyika. Provisional estimates assess the deposit at millions of tons.

Nearly $3-million worth of chrome and manganese were stocked at South Africa mines early last month because the railways, owing to an acute truck and traction shortage, were unable to move it. Most of the tonnage has been sold.

Chibuluma Mines Ltd., operating in Northern Rhodesia, plans to construct a cobalt treatment plant in the near future at Ndola. The site selected is adjacent to that on which Ndola Copper Refineries is to construct an electrolytic copper refinery.

The cobalt plant will be owned by Chibuluma Mines and will treat the metal contained in ore mined at the company's property. Treatment will be in three stages. The first, which is ex-

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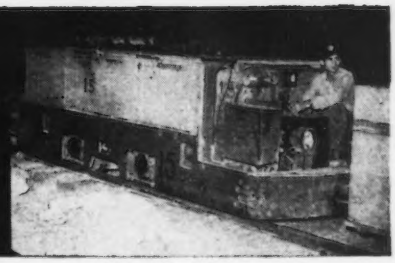

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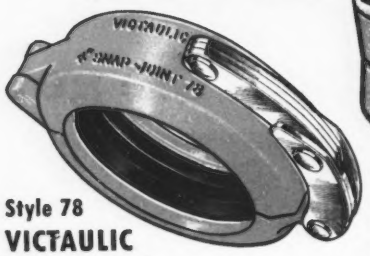

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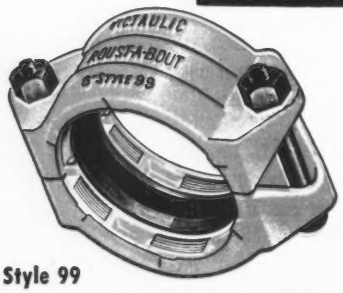

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VICTAULIC ROUST-A-BOUT COUPLINGS Best engineered, most useful plain end joint on the market! Simple, fast, husky. Easy to install with any socket wrench. Takes strong, positive, bull-dog grip on pipe. Sizes 2" to 8".

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VICTAULIC COMPANY OF AMERICA
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EASIEST WAY TO MAKE ENDS MEET!

pected to come into operation in 1956, consists of the electric smelting of the cobalt-rich concentrate to produce a matte of cobalt and copper. The second stage involves the production of cobalt oxide. The third stage will produce the metal.

Total cost of the plant is estimated at £500,000. Electric power will be provided by the Rhodesia Congo Border Power Corp. The municipaiity of Ndola has agreed to arrange for the provision of necessary housing for both European and African employees.

Chibuluma Mines is a subsidiary of Rhodesian Selection Trust.

A pilot plant of 10 tons daily capacity recently began operations at Akjoujt in French Mauritania. The plant is processing local copper ores.

It was reported recently (see *E&MJ*, August 1954, p 166) that the U. S. Foreign Operations Administration had granted the French government a loan of 500-million francs to finance a public works program in connection with the new copper project at Akjoujt.

Shaft sinkers at Merriespruit Gold Mine in the Orange Free State are claiming a world record 597 ft in 30 days. This was the third time in three years that the record has been claimed by mines bounding the little town of Virginia.

In March and April 1951, No. 3 shaft at Virginia mine was sunk 470 ft and 504 ft to break the then-existing record. The record was broken under the supervision of master sinker J. A. Fourie. The shaft is now 995 ft deep and will go to a final depth of 3700 ft. Merriespruit and Virginia are the two Free State mines in which Kennecott Copper of the U.S. holds a substantial interest.

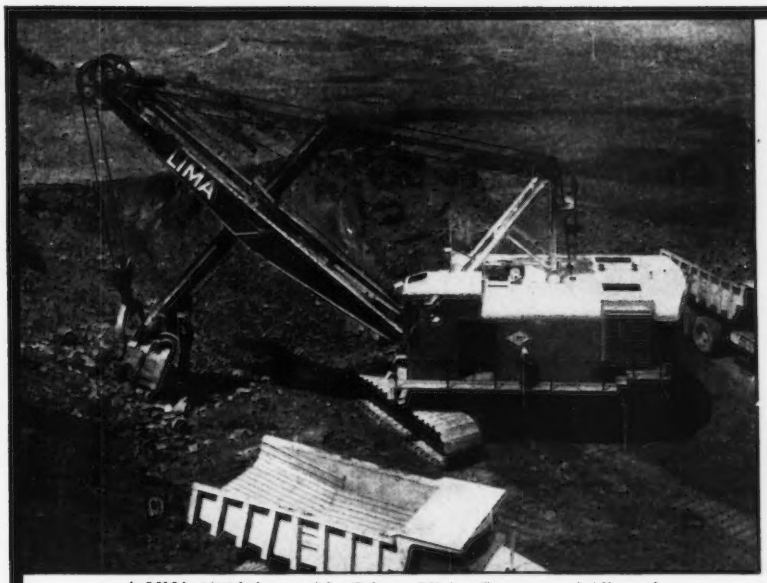
A young Pretoria geologist, J. D. Louw of the National Physics Laboratory, has advanced a new theory on how the gold and uranium have come to be in the Witwatersrand system—a theory which runs counter to accepted beliefs.

Using the delicate lead isotope method of fixing the age of uraninites, he estimated that the source from which the uranium minerals of the Rand derive was between 1800 and 2000-million years old. The highest age geologists assign to the Witwatersrand sedimentary beds is about 1000-million years. This indicates that the uranium minerals are much older than the Witwatersrand system.

One deduction from these findings is that the uranium and the gold which is closely associated with it must have been eroded from long vanished mountain ranges into the sandy, muddy and pebbly sediments which eventually hardened into the Witwatersrand beds. Up to now current theory was that the uranium was injected in solution into the Witwatersrand beds long after their formation.

A large deposit of strategic minerals, including lithia ores, monazite and tantalite, is being worked in the Fort Victoria District of Southern Rhodesia. At present, main deposits are being exploited by a small company, but it was understood that the Anglo-American Corp. was trying to secure options on land in the area.

Orinoco Mining Company uses a **LIMA** 2400 to move iron ore at Cerro Bolivar



A LIMA 2400 being used by Orinoco Mining Company, subsidiary of U. S. Steel Corporation, to move iron ore at Cerro Bolivar in Venezuela.

In rigorous service such as that at Cerro Bolivar, the LIMA 2400 is proving to many owners in different parts of the world its ruggedness and dependability. Designed to withstand the stress and strain of heavy operations such as this, it stays on the toughest job with a minimum of maintenance.

Whether *you* have a mountain to move . . . or just an ordinary digging or stripping job, you can't go wrong with a LIMA Type 2400. No other machine gives you as much as Lima. It'll pay you to investigate the 2400 along with other outstanding machines in the Lima line. Call your nearby Lima distributor today, or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

COMPARE! No other machine gives you as much as LIMA!

1. Big capacity drums and sheaves lengthen cable life, by reducing the need for double wrapping and sharp bends in cable.
2. All gears, smaller parts and shafts which are subject to extra wear, are flame or induction hardened for longer life.
3. Main machinery is placed well back of center of rotation, to eliminate excess counterweight.
4. Propel and swing gears and power take-off, are enclosed in sealed oil bath for dirt elimination and smoother, quieter operation.
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COMPARE and you'll specify LIMA for shovels, (¾ cu. yd. to 6 cu. yds.), cranes (to 110 tons), and draglines (variable).

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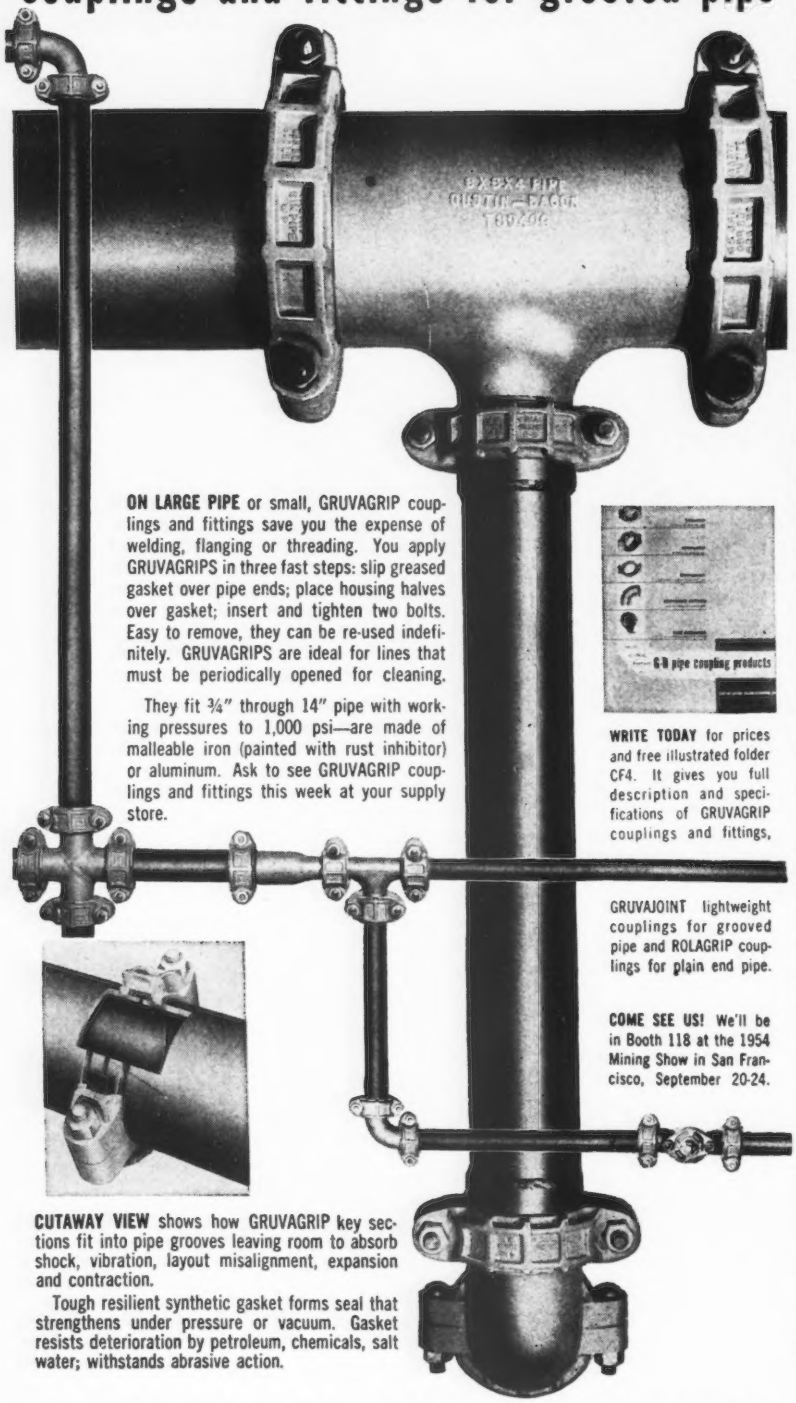
GRUVAGRIP

couplings and fittings for grooved pipe



ON LARGE PIPE or small, GRUVAGRIP couplings and fittings save you the expense of welding, flanging or threading. You apply GRUVAGRIPS in three fast steps: slip greased gasket over pipe ends; place housing halves over gasket; insert and tighten two bolts. Easy to remove, they can be re-used indefinitely. GRUVAGRIPS are ideal for lines that must be periodically opened for cleaning.

They fit ¾" through 14" pipe with working pressures to 1,000 psi—are made of malleable iron (painted with rust inhibitor) or aluminum. Ask to see GRUVAGRIP couplings and fittings this week at your supply store.

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GRUVAJOINT lightweight couplings for grooved pipe and ROLAGRIP couplings for plain end pipe.

COME SEE US! We'll be in Booth 118 at the 1954 Mining Show in San Francisco, September 20-24.

CUTAWAY VIEW shows how GRUVAGRIP key sections fit into pipe grooves leaving room to absorb shock, vibration, layout misalignment, expansion and contraction.

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IN AUSTRALIA

An inexpensive process to separate impurities from titanium in beach sands has been developed by New South Wales University of Technology. The impurity took the form of a yellow chromium compound. Under the new process, the separated chromium compound can be concentrated and used as a source of chromium or chromates. There are millions of tons of beach sand on Australia's eastern coast.

Prime Minister Robert G. Menzies is to officiate Sept. 17 at formal opening ceremonies of Australia's biggest uranium plant in Northern Territory's Rum Jungle uranium fields.

Large-scale production of uranium-oxide will get underway. It is to be sold to Britain and the United States for defense purposes. Output will be about twice as much as originally planned. A large quantity of ore has been stockpiled in anticipation of this operation.

The plant, finished several months ahead of schedule, was built by Consolidated Zinc Pty.

Work on a big open cut mining contract at the huge Rum Jungle uranium field in Northern Territory is to start very soon. Considerable quantities of modern machinery and equipment are being assembled for the job following their recent importation.

This includes a 164-ton Manitowoc excavator. The contractors for the job, worth several million Australian pounds, are George Wimpey & Co. Ltd. of London, England. The work may take several years to complete and will, among others, open out the famous White's mine, the original discovery of Mr. J. White, on which major underground development on the field has been carried out.

Brocks Creek Uranium N. L. now has three separate parallel showings of uranium ore. Two new uranium occurrences, one 400 ft from the shaft and the other 45 ft further west, both show torbernite. The underlying shaft has reached 70 ft in copper and uranium ore. The vertical shaft is down to 90 ft.

Spring Hill (N. T.) Gold N. L. reports that assays of the concentrates from previous operations showed a gold content of 1.7 oz to 2.3 oz a ton and the assay of the tailings was 3.8 dwt. Underground activity has been devoted to increasing the stope preparation on the eastern lode and further development on the anticlinal lode. A start has been made to locate the main western lode at the end of the adit.

Uranium mineralization, described as important, has been found on fields belonging to North Australian Uranium Corp. Chemical assay results have indicated ore of payable value. The area is at present being examined by the company's geologists to determine the extent of the deposits.

The main east crosscut on the 1060 ft

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ATLAS TYPE A STORAGE BATTERY LOCOMOTIVES

These ATLAS TYPE A Locomotives in service in Norway were purchased because of their superior design, proven low operating costs, and attractive first cost.

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level at Hill 50 Gold Mine N. L. has reached the eastern wall of the lode and shows its true width as 73 ft with an average value of 50 dwt over 9 ft. The crosscut is in the rich section which was first struck in drilling early last year.

Considerable decrease in lead output has been reported from the Northampton district in Western Australia but slight increase in the value of lead mined was noted in other Western Australian fields, the Ashburton and Pilbara fields.

Output of asbestos in Western Australia has also declined. Shipments of iron ore from Yampi Sound to New South Wales continue at high rate but are still at less than 700,000 tons per annum.

Western Australia has also registered a quadrupled production of beryl and a very big lift in the output of antimony. Western Australian production of tin continues to be small and the annual rate is only 120 long tons.

Costeaning has shown the Anderson's uranium lode on the Counter lease at Mt. Isa to be 140 ft long and 80 ft wide on the surface. The exploration is conducted by Australasian Oil Exploration Ltd. which has also pegged some 60 acres at Gorge Creek where a new orebody of considerable length and with promising grade similar to that of Anderson's lode has been discovered.

When the new FluoSolids plant of Peko Gold Mines N. L. is completed in the near future, the daily yield of metallic copper will rise to 12.5 tons. At present about 50 tons are continously treated every day but work on increasing the capacity to 100 tons is well advanced.

Development on the 400 ft level is also on schedule and all services are installed on the plant. The Dorr Co. of U. S. A. is handling tests for gold and copper extraction and diamond drilling on adjoining leases is expected to start within the next few months.

Victorian Mines Dept. estimates that 3000 persons are now engaged in the search for uranium in the State of Victoria. Old mining districts are carefully combed and according to official indications, the searchers range from schoolboys on vacation to retired mining prospectors who first scored mining successes several years ago in the great searches for good reefs.

In the meantime the boring activities at Inglewood, Victoria, are being proceeded with in the search for the main uranium reef.

Australian production of lead, zinc and copper ores and concentrates set new records in 1953, according to figures released in Melbourne by the Australian Mines and Metals Association. Tin production from Australian workings, however, was slightly lower than in any of the preceding five years.

Ores and concentrates produced in 1953 by the principal lead-zinc mines were estimated to contain 245,164 long tons of lead and 240,625 long tons of zinc, compared with 233,040 and 201,152 long tons respectively in 1952. The proportion of concentrates held in Australia for treatment also set a record.

The outstanding development in copper was the coming up of Mount Isa Mines as a producer of world rank. The mine accounted in large part for the overall Australian production increase to 36,495 long tons, from 20,088 long tons in 1952. Mount Isa's 1954-55 copper production is expected to exceed the record of 19,868 long tons set in the year ended June 30.

Lower lead and zinc prices pulled down the 1953 net earnings of The Consolidated Zinc Corp. by 16%, to £1.4-million, it was disclosed at a recent meeting of stockholders in London. Formed in 1949, Consolidated Zinc is a holding company which directly or indirectly owns the Broken Hill base metal mines and associated enterprises. In 1952 it planted a stake in the Western Hemisphere with the setting up of Consolidated Zinc Corporation of Canada Ltd.

The group maintained a high rate of capital expenditure, nearly £1.5-million, compared with £1.8-million in 1952. Half the 1953 investment was in Imperial Smelting Corp., which is located in the United Kingdom. Current investment commitments are of a somewhat lower order. Oustanding projects include

(*Continued on p 112*)

VITAL
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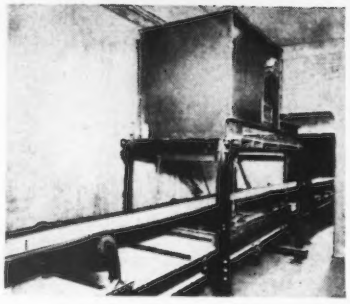
Merrick's close association, of over 40 years, with the mining industry assures the weighing tools of tomorrow.



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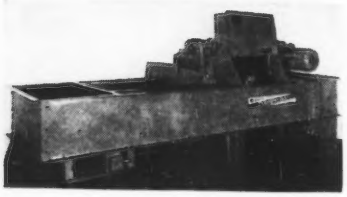

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The Feedoweight

Weight at a Glance Bull's 375 & 253

* Reg. U.S. Pat. Office

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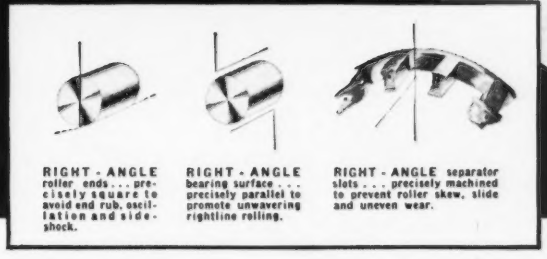

RIGHT - ANGLE roller ends . . . precisely square to avoid end rub, oscillation and side-shock.

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RIGHT - ANGLE separator slots . . . precisely machined to prevent roller skew, slide and uneven wear.

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Loaded at right angles, with no diagonal components to impose skew forces. Precisely square and parallel from every surface aspect. The solid cylindrical rollers of Rollway Right-Angle Roller Bearings follow the right-line motion of Newton's first law, providing *unwavering orbital rotation around the shaft.* Internal friction and heat are held to a minimum. Maintenance attention and replacement costs are low . . . life and load-performance qualities surprisingly high.

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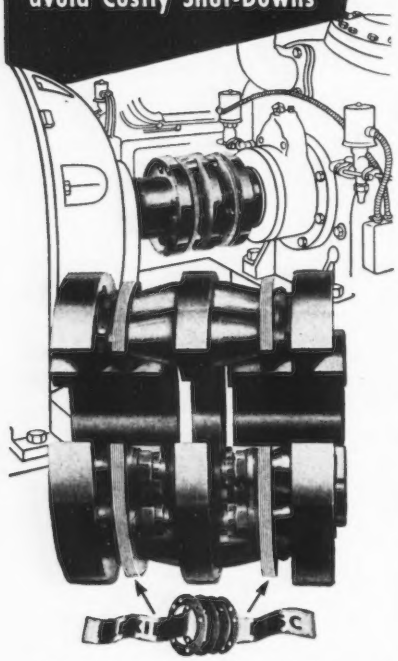
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

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NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
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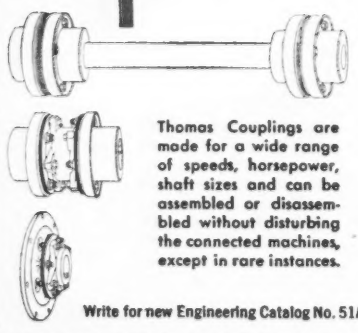

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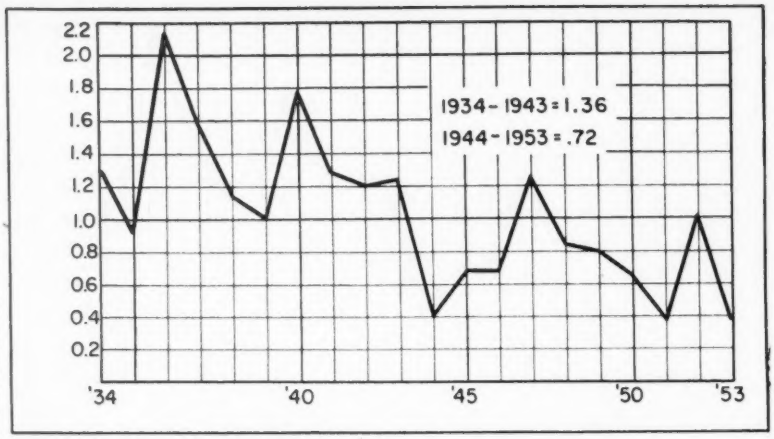

IDAHO MINING INDUSTRY (1934-1953) fatalities per million man-hours worked

Fatalities In Idaho Mining Cut Nearly 50% In 10 Years

FATALITIES IN IDAHO'S metal mining industry have been reduced almost 50% in the past 10 years.

This proud record was announced recently by George A. McDowell, Idaho Inspector of Mines. "This marked improvement didn't just happen," McDowell points out. "It it the result of a concerted attack on the mine safety problem by industry, labor and government."

McDowell

Reviewing recent growing awareness of mine safety problems, McDowell explained that, "Until the early 40's, little or nothing was being done to assure safe working conditions. However, about that time the larger companies began to employ safety directors who instituted safety programs for their respective operations.

"Also at about the same time," McDowell continued, "the workers in the industry were finally organized and in a position to effectively bargain for improved conditions.

"Safety committees, composed of workers and supervisors have functioned at most of the mines for the past 10 years and have certainly contributed no small part to the improved record. Management on the whole," he added, "is much more safety-minded than in former years. Equipment and methods are being constantly improved and always with an eye to more safety as well as more efficiency."

Pointing to a chart in his office in Boise, McDowell gave a statistical picture (see graph above) of Idaho mining's safety record. The chart showed that from 1934 to 1943, the average was 1.36 deaths per million man-hours. Through a concerted attack, this rate was reduced to .72 for the period from 1944 to 1953—an improvement of 47.2%.

"Incidentally, this .72 is not only much better than the national average but is even better than the .88 average of those 40 or so mines whose excellent records induced them to enter the National Safety Competition during the same 10-yr period," McDowell noted.

State government cooperation, although of comparatively recent vintage, merits a share in Idaho's safety record.

In 1949, the State Inspector of Mines was voted funds to employ a part-time deputy. In 1953, a larger appropriation made it a full time job. Now, for the first time in more than 60 years, each mine in the state is being regularly inspected, McDowell said. "Idaho probably was the last of the mining states to adopt a mining code," he added. "It was not until October 1952 that a code finally became effective.

McDowell was born in Pearl, a small Idaho mining town. He began assessment work at age 14. Following that he worked on a placer operation. At age 16, he began underground mining. In 1946, at age 27, he was elected to the office of State Mine Inspector and was at the time the youngest mine inspector in the United States.

"During my eight years in office I have learned many lessons in safety," McDowell said. "However, the principal one which I would like to point out is that a great majority of accidents are caused by men acting before they think.

"Serious and fatal accidents know no bounds and can happen in good as well as bad ground. I have also noticed that a large percentage of our fatal accidents occur in a group of men who have been mining for 15 and 20 years. Seemingly the reason is that they become accustomed to the existing dangers and do not take proper precautions."

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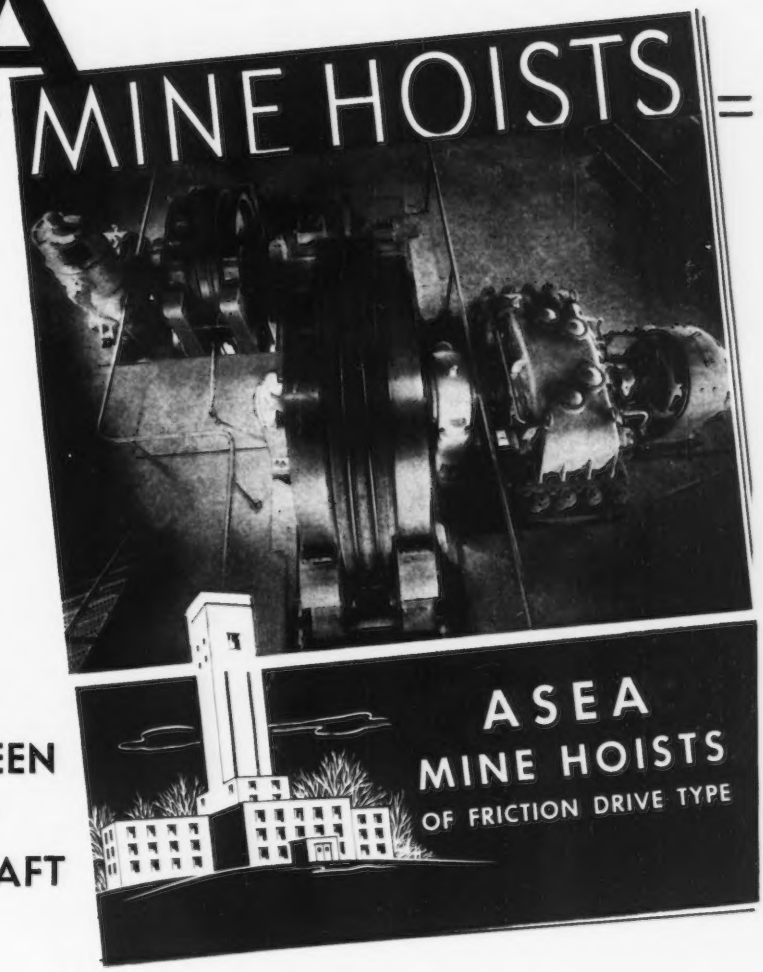

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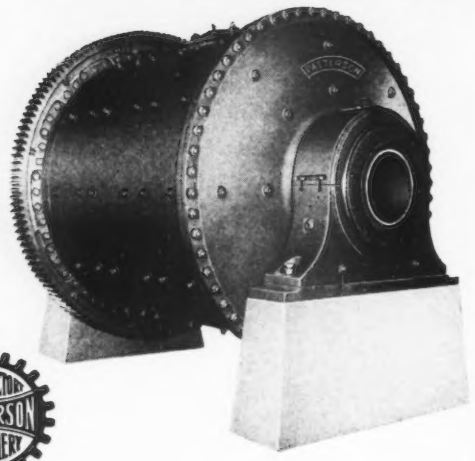

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Bakelite	Flint	Quartz
Blanc Fixe	Fluorspar	Rosin
Bauxite	Fillers	Rouge
Beryl	Ferro Chrome	Resins
Bentonite	Ferro Manganese	Sand
Brass Slag	Fireclay	Silica
Burned Lime	Fuller's Earth	Silica Gel
Borax	Ganister	Silicon Carbide
Calcium Carbonate	Garnet	Slag
Calcium Phosphate	Graphite	Sulphur
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Carbon	Glass	Talc
Carborundum	Hematite	Tripoli
Carbon Black	Ilmenite	Whiting
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MONTREAL

Australia (*Con't from p 208*)

£859,000 for a new acid and superphosphate plant at Cockle Creek, N.S.W., to be operated by Sulphide Corp.

Ore mined at The Zinc Corp. mine in 1953 set a new record figure of 548,476 long tons. The highest figure previously recorded was 535,443 long tons in 1941. Largely due to more efficient use of modern drilling and loading equipment, the average tonnage stoped per contract miner-shift in timbered stopes increased from 6.90 in 1952 to 8.68 in 1953. Output in wide-open stopes jumped from 9.96 long tons to 13.88 long tons.

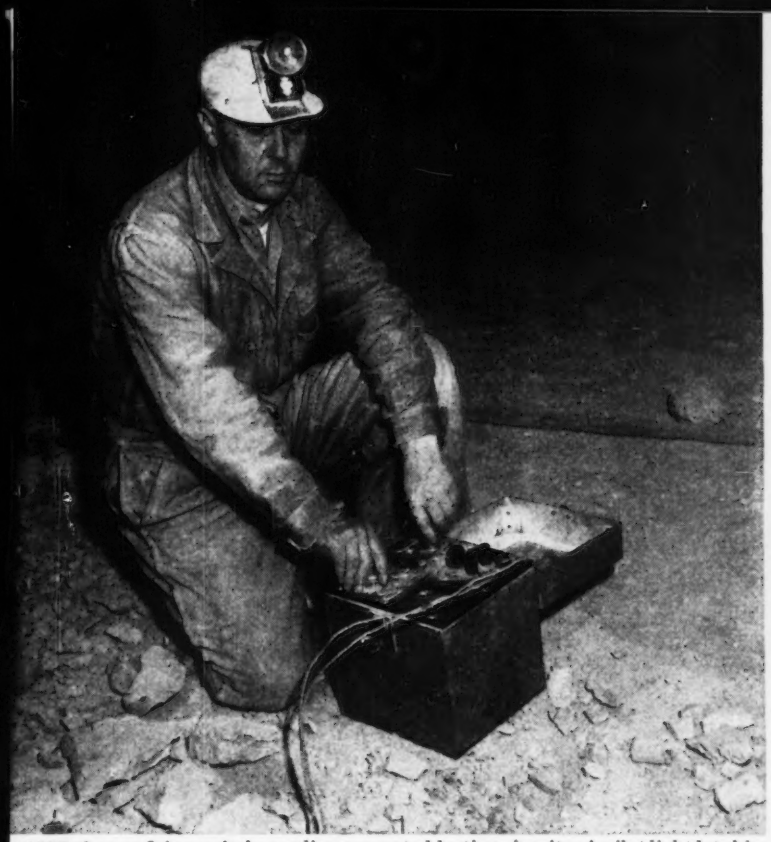
New Broken Hill Consolidated has completed an extensive surface and underground capital program. The service shaft is expected to be in operation to the No. 22 level by November. So far, the supply of ore to the company's own mill has been limited by the hoisting capacity of the haulage shaft on a one-shift basis. The balance of the ore is hauled through The Zinc Corp's main shaft for treatment in their mill. Meanwhile, New Broken Hill's mill capacity will be expanded from the present 360,000 long tons to 540,000 long tons. Ore production from the company's leases in 1953 reached 405,629 long tons, compared with 239,922 long tons in 1952. In this mine, too, stoping efficiency showed a spectacular increase of more than 50%.

Recent development work has indicated that there is sufficient ore for at least thirty years' operation at an annual rate of 540,000 tons, which is the projected mill capacity. The ore averages 11% lead and 12% zinc with 3 oz of silver per ton.

Following a month's shutdown in January due to an industrial dispute, Broken Hill Associated Smelters had a successful year treating lead concentrates from the Broken Hill field. Good progress has been made with the construction of the roasting and scrubbing plants. They are due for completion next year. When in operation, they will enable the sulphuric acid plant to utilize sulphur gases from lead concentrate roasters. The Associated Smelters plant is owned jointly by North Broken Hill and Broken Hill South.

Among the minor members of the group operating in Australia, Throwaway Bit Corp., a producer of detachable steel bits, is headed for liquidation owing to the continued trend toward tungsten-carbide tipped steels. The grant of a special mineral lease of 7000 acres on Stradbroke Island, Queensland, to Titanium & Zirconium Industries has given impetus to a major production increase program.

A £A300,000 company, to be known as Shaw River Alluvials N. L., will be floated shortly in Sydney to extend present limited tin recovery operations in the Marble Bar gold-mining district in Western Australia. Reported tin recoveries in the lease area have been as high as 4.3 lb per cu yd as assayed in concentrates, but much of this has been lost along with tantalite, columbite and gold because of inadequate recovery methods, it was reported.



ASTER throws firing switch, sending power to blasting circuits. A pilot light lets him ow exactly when to fire the blast. Output terminals are dead until that moment.

50-HOLE SHOT is loaded, then connected up with Du Pont MS Delay Electric Blasting Caps. Next: setting it off with CD-32 Blasting Machine.

"TRADE-MARK" of MS Delays: well-broken limestone, a setup for quick removal. In addition, these dependable Caps reduce concussion and prevent cutoffs.

How Du Pont CD-32 Blasting Machine Increases Safety in Missouri Limestone Mine

The Independence, Mo., limestone mine of the Stewart Sand & Material Co. started using a CD-32 about a year ago, shooting 40-50 holes connected in two series in parallel. This machine has satisfied everyone concerned. Operators like the idea of having positive control over firing: that no power can reach blasting circuits *unless* and *until* they throw the firing switch . . . that if a blast must be postponed, they can discharge the machine completely by releasing the charging switch. And the CD-32, weighing only 22 pounds and having no moving parts, is easy to carry and operate, eliminating need of permanent power-firing circuits . . . making for speed and efficiency of operations.

Du Pont CD Blasting Machines are available in four sizes, to fit any blasting condition you may face.

ALL FOUR eliminate the human element of generator-type machines.

ALL FOUR contain many important safety features in the wiring and switching system.

ALL FOUR have amazingly high capacity for their weight and size.

ALL FOUR save the cost of maintaining power lines for blasting.

THE TWO LARGEST can fire shots connected in series, parallel or parallel series.

For complete information on Du Pont CD Blasting Machines, contact the Du Pont Explosives representative in your district. He'll be glad to arrange a demonstration at your convenience. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

1954 AMERICAN MINING CONGRESS SHOW, San Francisco Civic Auditorium—Sept. 20-23.

Be sure to visit us at Booth 801. We're looking forward to seeing you.

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Blasting Supplies and Accessories

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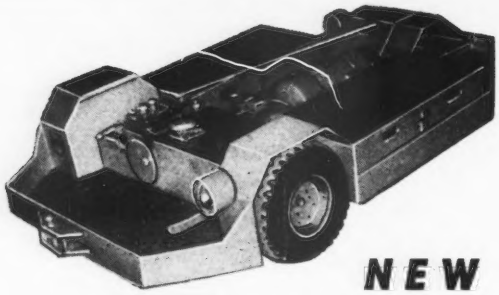

NEW

MODEL HD-8,
TWO WHEEL DRIVE, TUG TRACTOR
FOR SMALL MINES

- Direct drive—(No chains).
- Hydraulic disc brakes.
- Can be operated with ease.
- 18" in height, except at rear wheels. Maximum heigh 22".
- Two speeds—Forward and reverse.
- Continuous duty motor and large capacity battery, for heavy duty service.

Battery Chargers For All Types of Mining Equipment to Operate From AC or DC Power Source

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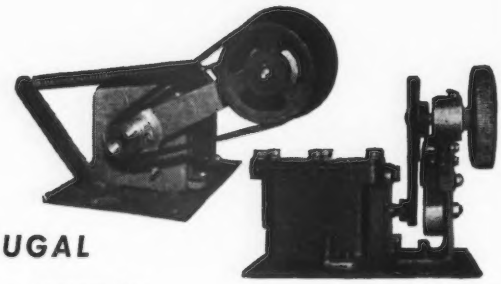

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SWITCH

immediate power cut-off
protects conveyor belts . . .

Ensign Centrifugal Switches with time delay relay, protect belts against fire due to slippage, reduces belt replacements, shut-downs, tonnage loss. Easily added to existing systems. Provides sequence operation in multiple belt or chain units. Operates forward or reverse. Dust-tight or explosion-tested enclosures.

Request Ensign Bulletin 1100 (dust-tight) or 1101 (explosion-tested).

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IN SCANDINAVIA

NORWAY

Negotiations for Swedish exploitation of 14 fields of copper-bearing ore in northern Norway fewer than 120 mi from Russian territory have reached the conclusive stage, according to a northern Norwegian newspaper.

Since Officials in Oslo denied knowing of any conclusive stage having been reached, it is possible that northern Norway was just trying to keep the issue alive.

Stretching from Kautokeino on the 69th parallel to Alta on the 70th, the ore field has been under study since last September by the Boliden Corp. of Sweden, which was negotiating for the concession. Since Boliden has been forced to turn to the Congo for copper ore to keep its Kiruna refineries in operation, the company is seeking a supply close to home.

The question of the concession has been often discussed in the Norwegian press since last September (1953), and it is generally expected that the concession will be granted, as the country does not have the economic resources to develop the area itself. Because the province of Finnmark, where the ore lies, is a stronghold of Communism in Norway (adjoining Russia), the government is said to welcome economic development there.

Boliden, it is said, will spend over $14-million before actual mining starts. Observers estimate this will absorb about half of the unemployment that is expected to arise in Finnmark due to the decline in fishing there.

Boliden is expected to earn back its investment within 50 years, after which time all rights and ownership will revert to the state of Norway. Project will include the building of a new mining city, development of hydro-electric capacity, and opening of a railway between Kiruna and Kautokeino.

Orkla Mines (Orkla-Grube-Aktiebolag) have announced plans to build a plant at Tambshavn for treatment of 15,000 tons of pyrites (iron and copper sulphides) a year.

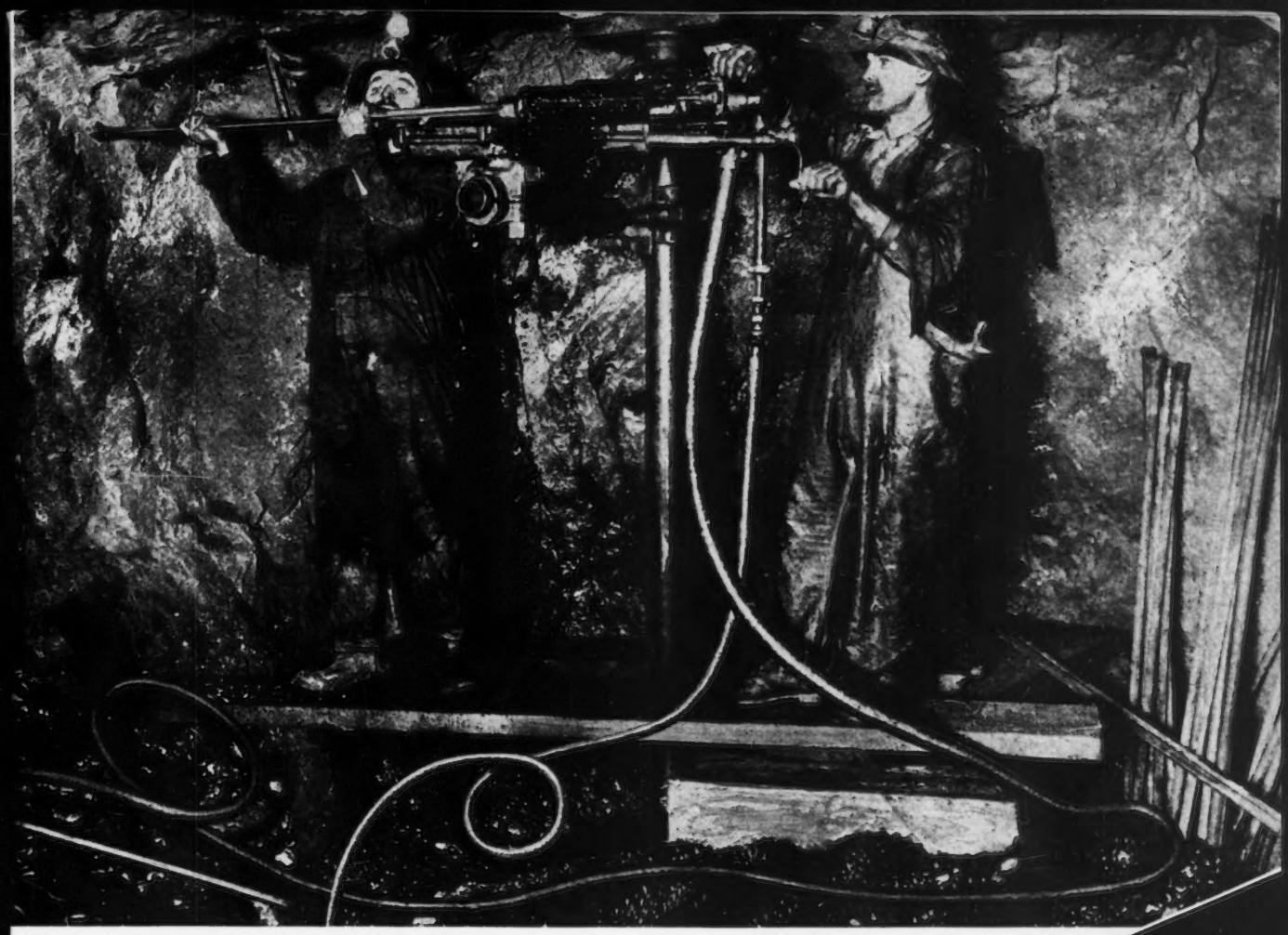
The company mined 354,701 tons of pyrite ores in 1953, and of this it exported 67,161 tons to Sweden and Germany. It smelted the rest.

Orkla is planning further exploitation of the pyrite deposits at Joma this fall. The Joma deposits are the largest pyrite finds in Norway. They are being developed also by Swedish interests.

Iron-ore shipments from Narvik in the first six months of 1954 amounted to 4,278,000 tons, going chiefly to Germany, Belgium, England and USA. Germany took the largest share of this.

Shipments this year are a little under the same period in 1953. Shipments in the second half of 1954 are expected to be about the same as the first six months.

The extensive mechanizing and expansion which the ore company, Luossava-



Thermoid Hose designed specifically for use in mines

Thermoid designs and manufactures many types of hose built to give longer service and lower operating costs in a wide variety of specific applications. These 3 are ideal for rugged mining work:

THERMINE Heavy duty air hose, mandrel-built with oil resistant tube reinforced by high tensile yarn. Smooth, abrasion-resistant cover.

THERMOFLEX Mandrel-built air hose for extreme service and direct connection to compressors. Smooth, black, abrasion-resistant cover.

#325 SUCTION HOSE For heavy duty water suction service. Smooth bore, wrapped hose with heavy wire reinforcement, durable cotton duck plies.

Thermoid research is responsible for new, better construction that makes Thermoid hose more durable . . . easier to handle. In addition to hose, your Thermoid Distributor also carries a complete line of Thermoid Conveyor Belting and Multi-V Belts. Call him for complete information. Or if you prefer write direct.

Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

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Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

TAKE A LOOK AT THE NEW KREBS CYCLONE...

a cylindrical two-stage classifier that gives you:

- sharper separation
- higher density underflows
- lower operating costs
- longer equipment life

ADVANCED DESIGN MEANS **BETTER** CLASSIFICATION

Here are design advantages that show why the Krebs cyclone does a better classifying job at less cost:

- Cylindrical two-stage design reduces undesired plus sizes in the overflow and undesired minus sizes in the underflow, produces cleaner, higher density sands **without** tramp sizes in the overflow. This is sharper separation.
- The primary cylinder creates an ideal fluid pattern that gives greater efficiency at lower psi, permits use of larger vortex finders. Reduced power requirements mean lower operating costs.
- Use of steel shells, precision-fitted with replaceable molded pure gum rubber linings — plus cylindrical design that lessens abrasive action — mean less wear, lower maintenance costs, longer equipment life.

BOOTH 470
AT THE MINING SHOW

If you can't be in San Francisco, send for bulletin 121, giving details of design and performance.

ANOTHER INSTALLATION

(Number 2 of a Series)

Four Krebs Model EE10-4 cyclones treating 1000 tons per day with subsequent processing of the sands. Emphasis is on fine sand recovery from tailings with effective slime rejection.

	FEED	OVERFLOWS	UNDERFLOW
GPM	769	708	61
% Solids	19	12	70
TPH	42	23	19
%+ 65	1.8		4.1
+100	6.2		13.8
+150	9.5		20.9
+200	7.6		17.1
+325	12.4	0.8	26.5
−325	62.5	99.2	17.6

This installation is producing very similar results to another job we supplied with similar objectives. The product from the tailings is used for mine fill with exceptionally quick set and fast percolation.

IF YOU HAVE A CLASSIFICATION PROBLEM . . .
our pilot plant facilities and staff of mineral dressing engineers are at your service.

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ara-Kiirunavaara A/B (of Sweden) has been carrying out since 1948 is expected to be completely finished by 1956, except for certain long-term projects.

One of the most important mechanizing projects was the fully automatic ore-loading pier, which was completed in 1951 by Nordstroems Linbanor A/B of Stockholm. The loader's present capacity is 5000 tph, handling several grades of ore simultaneously; it can be increased to 7500 tons by the addition of larger motors when needed. This loader is said to have the largest capacity in Europe, and while loaders in USA go as high as 15,000 tons an hour, the Narvik system is distinguished by its ability to handle several grades at a time.

Other projects remaining to be completed include improvement of ore-handling facilities from rail-cars into the stockpiling lots.

SWEDEN

After 10 years of preparation and an investment of about $4-million, A/B Zinkgruvor has opened a new mine in middle Sweden that will boost the firm's production from 100,000 tons ore a year to 250,000 tons.

Value of the orefield was first determined in 1944 after the lake covering the field was drained off. The field is said to contain 8 to 10-million tons of sulphide ore, which consists of lead sulphide (galena), copper pyrites, zinc blende, iron pyrites and some silver and gold.

Deposits of iron ore have been discovered in Erkilsaeter, western Sweden, by the Stora Kopparbergs Bergslag's mining company. Ore recovered at a depth of about 100 metres is being sent to the company laboratories for investigation.

IN ASIA

MALAYA

Subject to the result of a survey to be carried out last month, three companies —one Japanese and two British—are to develop the Temanggan Iron Ore Mine in Malaya, it was learned in Tokyo. Companies concerned are the Kokan Kogyo Co. of Japan, and Boustead and Co. Ltd., and the Andrew Weir organization of Britain.

A spokesman of Kokan Kogyo said deposits which could be tapped by the mine—situated near Keta Bahru on the east coast of Malaya, were believed to be between 5-million and 20-million tons. Development of the mine was started by the Manyo Iron Manufacturing Co., an affiliate of Kokan Kogyo, before World War II.

Development of the mine is to be started around October. It was added that yearly output was expected to reach 500,000 tons in the initial stage.

(Continued on p 220)

Ducon Sampler as used with portable wagon drill.

discover

AND CONTROL

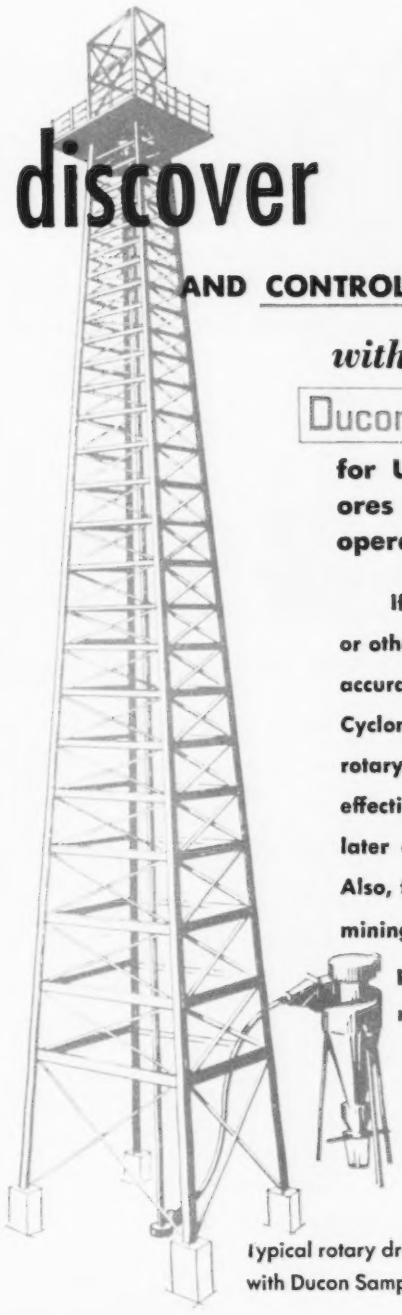
with

Ducon SAMPLERS

for Uranium, other precious ores and general drilling operations

If you're prospecting for uranium or other valuable ores, discover more accurate samplings with the Ducon Cyclone. It is easily mounted on rotary and wagon drill units and effectively collects drill cuttings for later evaluation of penetrated ores. Also, for general drilling and related mining operations, Ducon Cyclones provide a simple and effective means for dust control.

Write today for full details



Typical rotary drill installation with Ducon Sampler.

the name in dust control

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instant pH readings anywhere

Completely self-contained in waterproof ever-ready case with shoulder strap.

Instrument size: 3 x 5⅞ x 2½ inches
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Permits continuous direct reading of pH. No buttons to hold down or dials to turn.

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Canadian Asbestos Mines Expand Workings

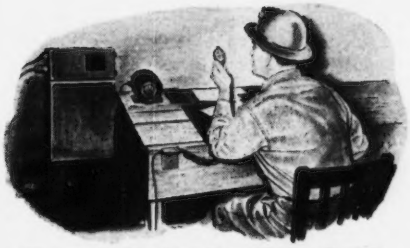
Munro Mine Goes Underground

JOHNS-MANVILLE's Munro Mine, Matheson, Ontario, is now digging an 800-ft main shaft and a 300-ft service shaft in preparation for underground production in 1958. Munro Mine was officially opened in September 1950 as an open pit operation (pit in foreground). Open pit mining is continuing. Mill is in background.

Studio Frechette, Black Lake, Quebec

Johnson Opens New Plant at Megantic Mine

JOHNSON'S ASBESTOS CO. is reaching capacity production at its $8-million Megantic Mine at Thetford Mines, Que. Some 6000 tons of rock will be mined daily, 4000 tons milled. New plant, opened July 8, employs about 225 workers. J. M. Cunningham is mines superintendent; M. C. Pharo is mill superintendent.



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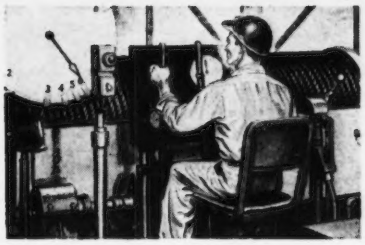
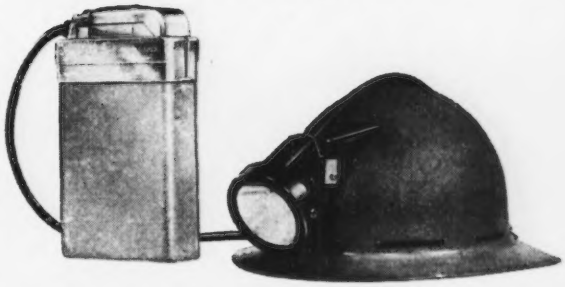
Messages are dispatched instantly to all motormen, who can receive and reply while trips are in motion. System keeps main line haulage-ways free of traffic tie-ups; reduces errors and accidents; prevents excessive stop-and-start strain on equipment.



M.S.A. HOISTPHONE

Continuous, clear voice communication between hoisting engineer and cage, at any level, and while cage is in motion. Ideal for safer load leveling, inspection trips, shaft repairs. Utilizes existing wiring. ALSO —M.S.A. PORTABLE HOISTPHONE—compact unit can be set up anywhere, put into immediate service. Permits temporary communication for inspection work, emergency jobs.

EDISON R-4 ELECTRIC CAP LAMP— M.S.A. TYPE K SKULLGARD



More and better illumination for today's modern mining methods. The R-4 Lamp's brilliant, unfailing illumination lets miners work faster, better, safer. The famous Type K Skullgard, is strong, light, durable. Maximum head protection that is not affected by oil, water, perspiration.

These M. S. A. products can help answer

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M.S.A. SELF-RESCUER

For immediate breathing protection in emergencies. Vital to the miner while traveling through carbon monoxide to fresh air. Available in cache assemblies for storage throughout the mine, or in individual carrying cases. U.S. Bureau of Mines Approved.

M.S.A. CHEMOX

Provides complete breathing protection in any atmosphere. Chemox generates its own oxygen from replaceable chemical canister. Weighs only 13½ lbs. Comfortable in service. U.S. Bureau of Mines Approved.

M.S.A. DEMAND WORK MASK

Breathing protection for planned work in toxic atmospheres. Mask provides self-contained air or oxygen supply. Connecting hoses lets wearer move freely. Manifold arrangement permits use of more than one unit from a single cylinder.

M.S.A. DUSTFOE RESPIRATOR

Maximum protection against dusts. This unit is compact, very light in weight. Its design eliminates "blind-spots," provides wearing comfort that encourages full-time use. U.S. Bureau of Mines Approved.

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Made throughout of Dynel, the new fabric that resists acids and caustics, M.S.A. ChemKlos answer the need for longer-wearing, smarter-looking work clothes. Special weave for maximum resistance to abrasion. Also, miner's rubber suits, boots, etc.

M.S.A.-LAMB AIR MOVER

Practical, portable ventilating device that uses only compressed air or steam. No motors, turbines, fans. Three sizes—largest size moves as much as 5,160 cu. ft. air per min. Forces air in, or sucks fumes out.

M.S.A. RAIL PUNCH

Makes quick, safe work of punching holes through web sections without need of external power.

M.S.A. PNEOLATOR

Portable, self-contained automatic artificial respiration device. Accepted by A.M.A.

also—a complete line of portable instruments for detecting CO, H_2S, SO_2, HCN. Instruments for collecting, sampling, counting dusts. First aid kits and materials.

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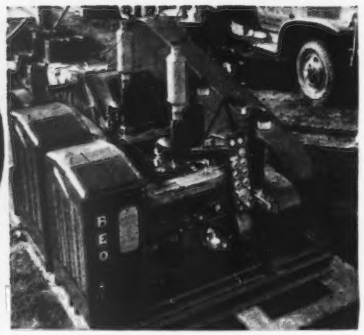

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On all 50-180 continuous horsepower services—operating on gasoline, liquefied petroleum gas, or natural gas—these dependable spark-ignition REOs deliver (1) high horsepower to displacement and weight; (2) low-cost operating efficiency, (3) long service life, (4) easy maintenance, (5) simplified major repairs.

Get all the money-saving facts about the many REO heavy-duty features and low operating costs. Write for specifications and name of nearest dealer.

INDUSTRIAL AND MARINE ENGINE DIVISION
REO MOTORS, INC., LANSING 20, MICH

A new iron ore mine financed entirely by Malayan capital may shortly be operating in the swamp-ridden and isolated area of Bukit Kepong, west of Labis Johore.

A company—Kepong Prospecting Ltd.—intends to sink between 5-million and 10-million Malayan dollars in the venture if tests are favorable.

RUSSIA

Russia is claiming new gains in metals output. According to the official newspaper *Pravda*. the Ministry of Ferrous Metallurgy fulfilled its production quota by 100.5% during the first half of 1954. The Ministry of Non-Ferrous Metallurgy achieved 102% of plan.

These output gains are reported for various metals during the first six months of 1954 as compared with the same 1953 period: iron, 6%; steel, 9%; zinc, 7%, and lead, 15%. Figures on copper production again were omitted.

JAPAN

A process for extracting 85% of uranium contained in poor host-minerals such as apatite, mozite, illuminite, monazite and zircon reportedly has been developed by Schinichi Nishimura, 31-year-old scientist at the mineralogical laboratory of Kyoto University, alma mater of Dr. Hideki Yukawa, Nobel prize winning nucleonic physicist.

According to Nishimura, waste fluid of the process for making phosphoric acid from the host-minerals is first freed of obstructive elements, and the uranic substance in the fluid is caught by an organic compound. Uranium, still containing impurities, is extracted from the compound. To remove the impurities, a uranic acid soda precipitate is obtained with alkali. Pure uranium is obtained by refining the precipitate.

Nishimura said that his process, if successfully industrialized, will extract from ores which contain 0.1-0.2% of uranium. Nishimura now is going to tackle the problems of industrializing the process.

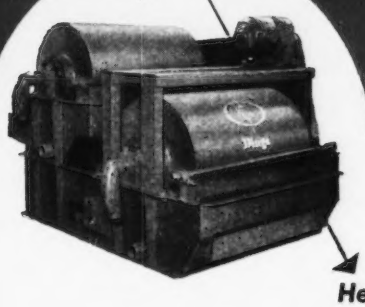
IN THE NEAR EAST

ISRAEL

Potash production at the Dead Sea Works had reached 2600 tons a month early this summer and was steadily increasing.

The potash is being extracted from carnelite accumulated in evaporating pans since the plant closed in 1948. Large quantities of carnelite remained to be removed and the normal process of operation had not been set into motion.

Dings



. . . the leading name in the development of

MAGNETIC SEPARATORS for TACONITE CONCENTRATION

Back in 1943, Dings Magnetic Separator Company experience and equipment was instrumental in helping to develop the commercial flow sheet that is being used by today's large taconite operators.

In 1947, Dings furnished the first high intensity "cobbing" separators to handle ball and rod mill feeds which precede the finisher separators.

This continuing research and field engineering, in conjunction with taconite company personnel, has made Dings the leading name in the wide field of magnetic separators for taconite concentration . . . including permanent magnet separators for both high intensity and medium intensity finisher duty—full width separators up to 72" in width—and now, the new double drum magnetic separator, developed specifically as a finisher separator for taconite and magnetite plants handling extremely fine feed in slurry form.

Here are the "highlights" of Dings' new Double Drum Magnetic Separator which has found wide acceptance for taconite concentration . . . . .

• **No underwater spray pipes.** Water manifold provides uniform washing of concentrates *above* the water level — overcomes operators' objection to submerged sprays.

• **Tailings discharged with overflow.** This unique feature permits discharge by means of overflow, without passing through the incoming feed—maintains constant submergence of the drum, with no spigot discharges being required. Dings double drum separators consistently produce lower iron tailings.

• **More compact.** Dings unit is more compact, yet readily accessible for easier operation and extremely low maintenance.

• **Proved design and construction.** Dings magnet assembly has correct number of poles to develop uniform field throughout full length of magnet arc, with minimum iron losses. The desirable combination of full width "curtain" washing action and narrow gap pole spacing permits uniform discharge of maximum grade concentrates.

Dings manufactures a complete line of drum and belt type magnetic separators for all phases of taconite concentration, ranging from rod mill cobbing to finisher work on —325 mesh concentrate.

See the **3-D PHOTOS** in our exhibit at the 1954 Mining Congress **BOOTH 2006**

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In just 10 seconds this patented snap-on coupling joins lengths of flexible ventilation tubing. And, only Mine-Vent Tubing has it! Faster coupling and easy hanging of Mine-Vent means fresh air always *where and when you need it* . . . at the face, immediately after blasting . . . a constant supply of fresh air to keep working energies at peak capacity. For new ventilation efficiency — lower production costs — write your needs to AMERICAN BRATTICE CLOTH CORP., 220 Buffalo St., Warsaw, Indiana

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Durable, easy-to-handle fiber drums keeps Mine Vent in perfect condition until you need it

MineVent TRADE MARK Tubing

New dams and pans were under construction and a canal for transferring sea water into the evaporating pans already had ben finished. Last spring the Dead Sea Works was planning to open a technical planning office in Beersheba.

IN THE PHILIPPINES

Work at the Toledo Copper Mine is progressing on schedule. Latest estimate is that the new mill will start operating about January, considerably earlier than had been anticipated.

Another orebody has been opened up on the property which was picked up by a geophysical survey about ½ kilometer from the present orebody. It is not as extensive as the main orebody but was averaging about 1.7% copper and may contain 3 to 5-million tons. It can be used to upgrade the original orebody which averaged about 1% copper.

Considerable diamond drilling has been done on Marinduque Island but no orebodies of large extent have been yet indicated. There is reportedly a wide band of copper mineralization through the island but relative inaccessibility necessitates ore of better than average grade in order to be mined profitably.

One small area has been located with a good zone of secondary enrichment but transportation is lacking. Another place has a considerable showing of native copper. As often happens in the Philippines, there is considerable overlapping of claims and litigation over property rights.

Production at the Philippine Iron Mines at Larap has been excellent. July should see over 100,000 tons shipped, all going to Japan. Some small iron mines have been opened in the Paracale District which total about 15 to 20,000 tons per month. Japan recently allotted $40.7-million in foreign exchange to import 2,600,000 metric tons of iron ore and 325,000 tons of scrap for the first half of its fiscal year, April-October. Nearly one-third of the requirements will have to come from the Philippines.

The gold mining industry has improved a little because of the better price for gold in the open market, now about P110 per oz. While no new gold deposits are being developed, the gold producers are operating as usual. There is some report that Atok-Big Wedge, which has been shut down since the first of the year, may resume operations.

An additional 250,000 tons of chrome ore will be shipped to the United States under an agreement recently concluded between the U. S. Government and Benguet Consolidated Mines Inc.

John W. Haussermann, president and general manager of Benguet, said that the new contract will raise exports of chrome ore from the Philippines by his company

(*Continued on p 226*)

Diamond Core Drilling

Mineral Exploration

Foundation-Test Drilling

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More than 15 years experience with trained crews. Estimates on request.

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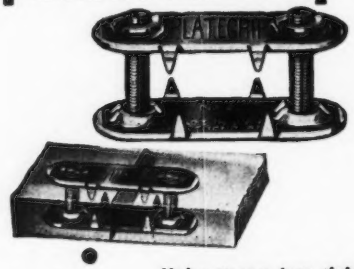
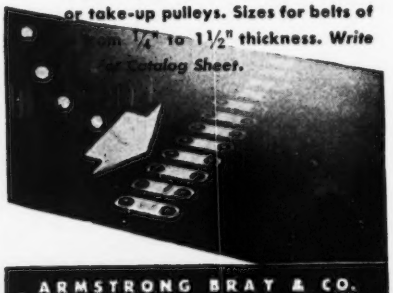
PLATEGRIP
PLATE FASTENERS FOR CONVEYOR BELTS



Make strong dust-tight, water-tight joints in belts of any width. Special design spreads tension uniformly across belt, allow natural troughing of belt and assures smooth operation over flat, crowned or take-up pulleys. Sizes for belts of from ¼" to 1½" thickness. Write for Catalog Sheet.



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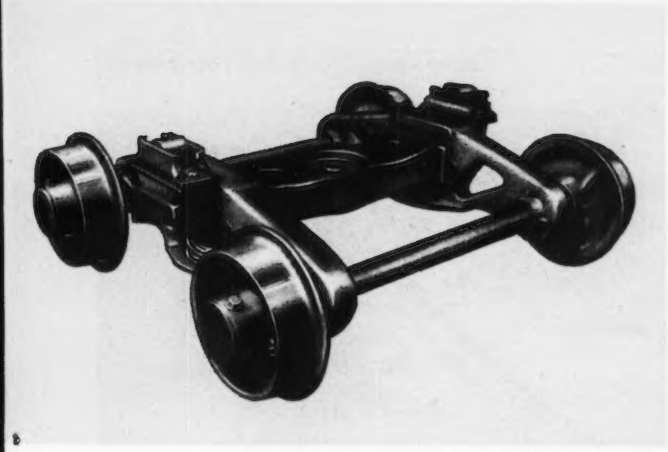
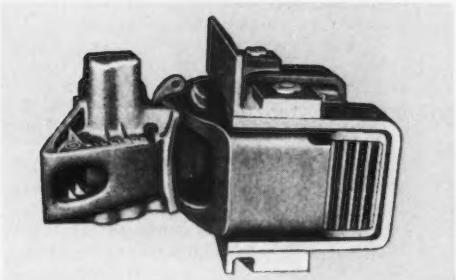


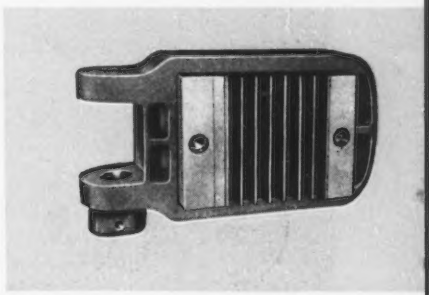
NATIONAL equipment cuts per-ton costs

NC-1 MINE CAR TRUCK is the latest example of National's pioneering in better equipment. Among NC-1 truck advantages are longer and softer ride springs, friction damping mechanism that controls vertical and transverse oscillations, automatic frame alignment and cast one-piece bolster with large lubricated center bearing. A-9821

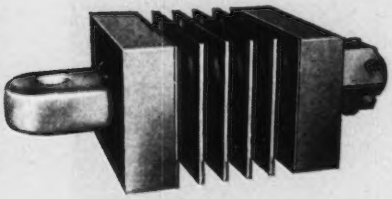
WILLISON AUTOMATIC COUPLERS save time with maximum safety, couple at either end of car or locomotive, require no manual assistance, eliminate damaging slack, permit high speeds with maximum stability.



NATIONAL MI-235 Rubber-Cushioned Draft Gear primarily used in Willison spherical-horn coupler assemblies for drop-bottom cars and locomotives; are effective with link and pin bumpers and in strap yokes.

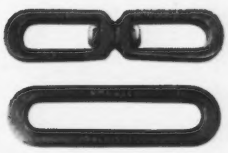


NATIONAL MI-225 Rubber-Cushioned Draft Gear for locomotives and large capacity cars not required to operate through rotary dump. Give maximum impact protection in minimum space.



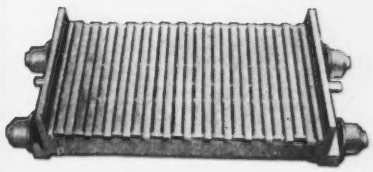
NATIONAL MI-230 Rubber-Cushioned Draft Gear for cars in rotary dump service. High-capacity rubber pads with soft initial action provide maximum impact protection, lengthen equipment life. Available in capacities and designs to fit individual requirements.

NACO STEEL WHEELS, made from quality-controlled Naco cast steel—of high yield point, great tensile strength and ductility—reduce tread spalling or flange breaking. Available in all sizes regularly used in mining or industrial operations.



NACO STEEL SWIVEL HITCHING AND LINK

CAST ALLOY STEEL ORE-GRINDING BALLS



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Attend American Mining Congress 1954 Mining Show

San Francisco, September 20th-23rd

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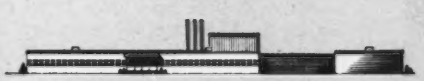

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Your product sells five days a week only if it compares successfully with competitive products.

In case after case, a product compares successfully with competition only because it is separated, sized and/or deliquefied with the best obtainable screens. Not just good screens, but the best obtainable. Bixby-Zimmer Screens.

Bee-Zee Screens are precision spot-welded of stainless steel...can be fitted to any screening equipment...with supporting rods spaced for best performance.

Tri-Rod for knife-like separation.

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New Grizzly Rod combines the best features of round and tri-rod.

New Grizzly Rod with protective skid rod guards against abrasive action without sacrificing efficiency or percentage of open area.

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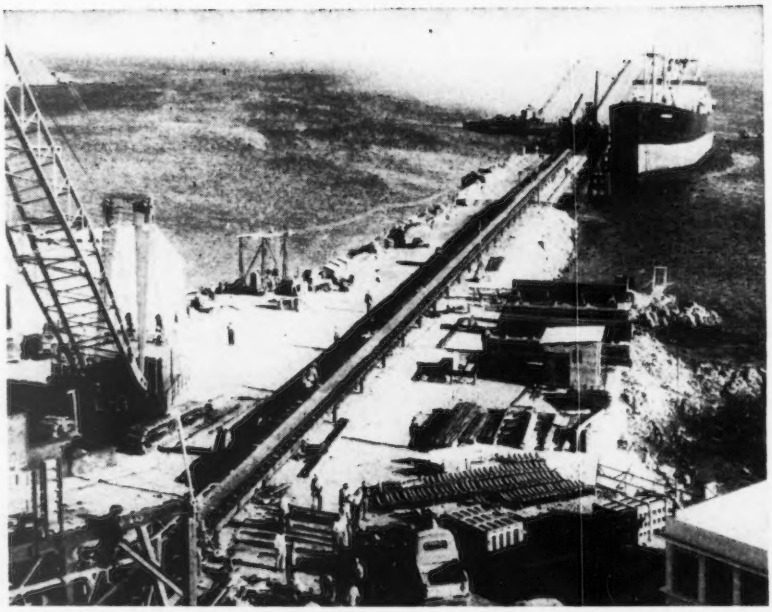
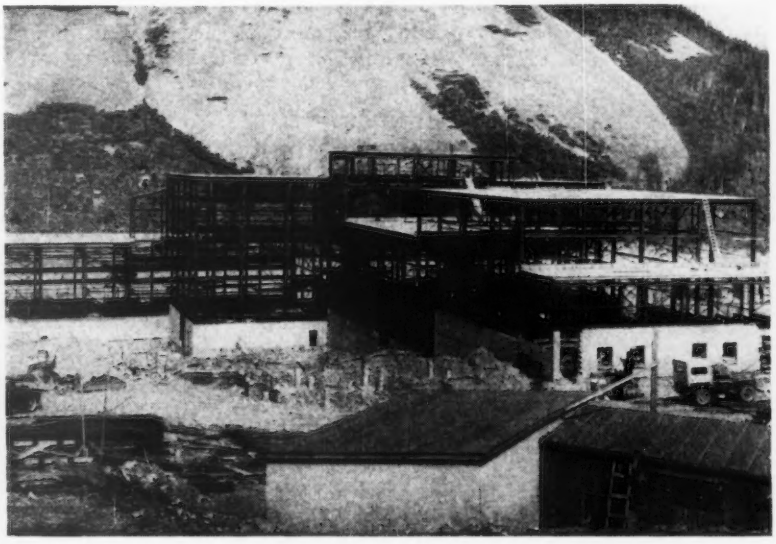


PERUVIAN IRON ORE from the Marcona Mine, about 300 mi south of Lima, is conveyor-belt loaded into ocean-going boats at San Juan Bay, 37½ mi from the mine. Ore carriers can be loaded in less than 8 hrs through use of a 42-in. wide B. F. Goodrich conveyor belt which extends 1100 ft out over the Bay. The Marcona Mine is jointly owned by Utah Construction Co. and Cyprus Mines Corp. (*E&MJ*, January 1954, p 84).



Gaspé Copper Smelter Nears Completion

PARTIALLY COMPLETED SMELTER of Gaspé Copper Mines, is scheduled to start operations in February 1955.

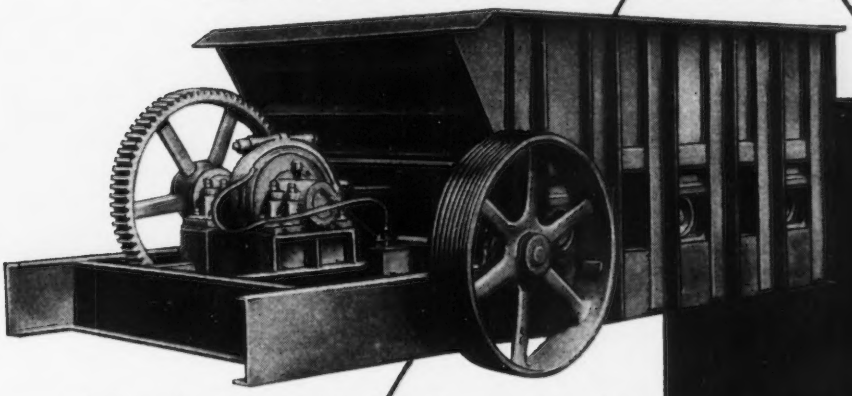
A subsidiary of Noranda Mines, which holds 95.5% interest, Gaspé Copper is located in the rugged wilderness of the Gaspé Peninsula, Que., some 25 mi south of the St. Lawrence River. Ore reserves are estimated at 67-million tons averaging 1.3% copper. Mine is being geared for production at 6,500 tons daily; the mine and concentrator to start operating late this year, while the smelter awaits the arrival of additional hydroelectric power. Capacity of the smelter will be 125 tons of copper anodes a day.

Although little more than 20 mi from the route of the first explorers who sailed up the St. Lawrence 400 years ago, this section of Canada has until now been left quite undeveloped. To service the mine a completely new community is being established. Named Murdochville in honor of Noranda's president, James Y. Murdoch, it will be a planned and model town of 5000 inhabitants.

A Great Combination..

For Low Cost Handling and Crushing Operations!

A combination of McLanahan Reciprocating Plate Feeder and Rockmaster Crusher is your answer to most economical feeding and crushing of 1000 tons or more of limestone, ore or rock per hour. Equipment can be furnished as component parts or as separate units to best suit your application.



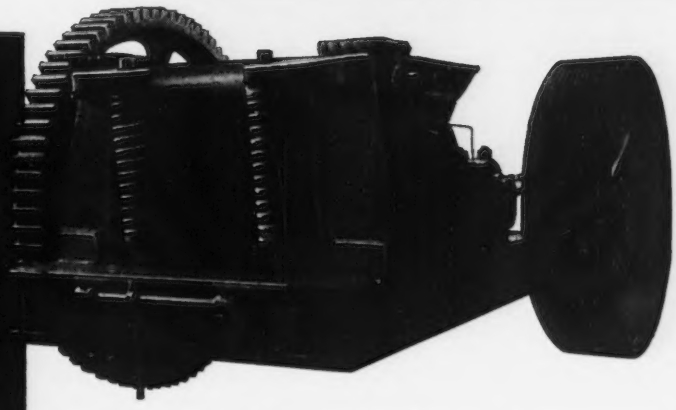
1

Heavy Duty

Built to handle materials from the size of sand to shovel-loaded rock, McLanahan Adjustable Reciprocating Plate Feeders automatically control the rate of flow of material, and are quickly adapted to the producing capacity of any machine.

2

Single Roll



The McLanahan Rockmaster Crusher is the economical solution to most any crushing problems. Greatest savings can be achieved by this combination of equipment. Outstanding for primary and secondary crushing operations, for use on limestone, gypsum, rock, gravel, shale, iron ore, slag and other materials.

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Dependable Products: **Single and Double Roll—and Jaw Crushers, Crushing Plants, Reciprocating Plate and Apron Feeders, Roll Grizzlies, Conveyors, Elevators, Screens, Scrubbers, Steel Log Washers, Sand Drags, Hoists, Jigs, Dry Pans, Dryers, Scrap Bundlers, Pulleys, Gears, Bearings, Sprockets, Sheaves, Rollers, Bin Gates, Elevator Buckets, Gratings, Car Wheels, Ferrous and Bronze Castings.**

CONTINUOUS MINING?

Want 6 hours or more actual loading time per shift?

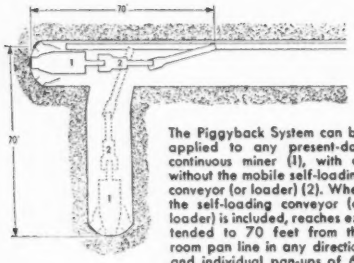
LONG PIGGYBACK® CONVEYOR SYSTEM

By actual time studies, up to six hours loading time per shift is not unusual with the Long Piggyback* System—even when it is operated with mobile loaders in two or more rooms.

This unique system offers the same advantages when used with any type continuous mining machine. The Long System utilizes practical, low-investment, low-maintenance chain conveyor equipment that has been proven in service. With the Piggyback System, enough potential advance can often be provided to allow operation of an entire shift without interruption.

*Trade Mark

THE LONG PIGGYBACK SYSTEM FOR CONTINUOUS MINING



The Piggyback System can be applied to any present-day continuous miner (1), with or without the mobile self-loading conveyor (or loader) (2). When the self-loading conveyor (or loader) is included, reaches extended to 70 feet from the room pan line in any direction and individual pan-ups of 60 feet become practical.

WANT MORE DETAILS OR A DEMONSTRATION? WRITE US TODAY.

The **LONG** Company
OAK HILL, W. VA.

Formerly Long Super Mine Car Co.

Philippines *(Con't from p 226)*

to 40,000 tons per month and will increase Philippine dollar reserves by $600, a month. Benguet now will be exporting 480,000 tons a year with a value of $7.2-million.

In view of this contract, Haussermann said, the company is planning to expand operation of its properties in Zambales where chrome is mined. About 1200 men are employed at the Zambales operation.

Haussermann said also that he is planning to expand his gold mining operations in Baguio from 2800 to 4000 tons of ore daily. These expansion plans call for expenditure of $2-million and will boost the number of employees from 6400 to 10,000.

IN EUROPE

ITALY

Last-minute conferences between federal government officials and mine owners averted a shutdown last month of all Sicilian sulphur mines.

After two years of practically fruitless exchanges with the Central Government, the Sicilian mine owners notified government officials that all mines would cease operations Aug. 20.

This threat precipitated hurried conferences. The Sicilian Regional Government immediately sent a delegation to Rome to obtain financial help for the industry sufficient to prevent the closures.

Meanwhile, the labor unions had instructed the 10,000 workers in the 360 mines to keep the mines open, even if the owners ordered them closed. A serious labor crisis was developing.

Central and regional government officials began negotiations Aug. 5 in Rome. On Aug. 18, the owners, promised government financial aid, rescinded their closure orders.

To meet labor costs and to help foot the bill for modernization, the Central Government has authorized the Bank of Sicily to lend the Ente Zolfi Italiano (Italian Sulphur Board) the sum of 1000-million lire.

The loan is recognized in the industry, however, as nothing more than a palliative but it is expected to accord small mines another three or four months in which the owners can discuss with the government more far-reaching measures. Few experts in Palermo see much chance, unless there is a steep rise in sulphur prices, of making these mines pay.

For more than a year there have been practically no exports, except for a small consignment believed to have been sold recently to Czechoslovakia at a price of around 39,000 lire a ton, compared to the world price of 22,000 lire.

The price of 39,000 lire is understood to have been offered at the end of last year to the British Sulphur Exploration Syndicate, which groups the biggest British consumers. But although anxious to find a source of supply near home and outside the dollar area, the British Syndicate was believed to have told the

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Here's practical technical help on the whole range of compressed-air equipment and systems — how they're planned, selected, tested, operated, and maintained. Every important type of apparatus is covered — pneumatic tools, rock drills, and other air-powered devices, compressors, drivers, aftercoolers, piping, and even entire compressed-air distribution systems.

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By the Compressed Air and Gas Institute

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This handbook, simply written yet technically thorough, gives you an enormous fund of information on pneumatic grinders, drills, and impact wrenches, air hoists, drivers, stopers, etc. An entire section devoted to the industrial applications of compressed-air power guides you in selecting the **right** piece of compressed-air equipment for a particular industrial job.

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Gives you each step in testing to determine the performance of air compressors and blowers and to make sure they stand up to performance guarantees. These methods are based on the ASME Power Test Codes for Centrifugal Compressors, Displacement Compressors, Blowers and Vacuum Pumps.

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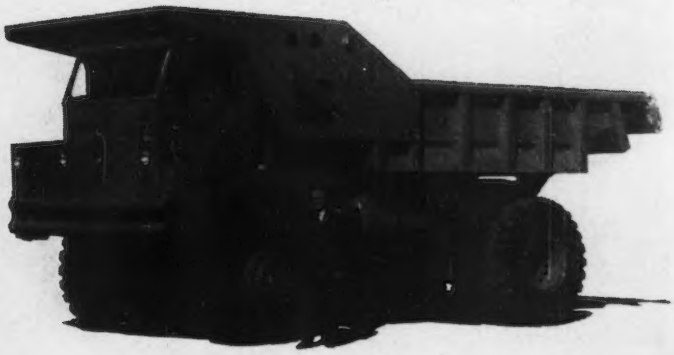


Dart cuts costs!

For the majority of its 51 years of engineering and building specialized heavy duty trucks, The DART TRUCK COMPANY has served the Mining Industry.

Dart engineering has produced many "firsts" in design which today are standard. The DART line includes models for mining ranging from 10 ton capacity through 75 ton capacity . . . the most complete line of off-highway trucks . . . all are built to provide maximum haulage with minimum maintenance, even under the most rigorous conditions.

DART 20S

DART 35SA

DART 10S

DART 75TA

DART TRUCKS

Kansas City 8 Missouri

SUBSIDIARY OF THE CARLISLE CORPORATION

ANACONDA COPPER MINING CO.'s Travona Mine at Butte, the main shaft of which is on the first lode claim in this famous Montana mining district, was closed July 16. Chester H. Steele, vice president in charge of western operations for ACM, said that high costs were the principal reason for the shutdown and added that a reduction in costs would make reopening possible any time market conditions warranted. Another historic mine is to be shut down about Oct. 1 (see New Jersey news, p 175).

Italy *(Continued from p. 226)*

Sicilians that their figure was too far out of line.

Extent of the crisis for one of the island's main industries is shown by the fact that, although current production is less than 65% of the pre-war level, home consumption and exports in the year ended July 31, 1953, amounted to 108,866 tons against production in the same period of 234,951 tons it was pointed out.

WEIGH IT ON THE GO!

Builders Conveyoflo—the modern conveyor meter — totalizes the weight of dry material passing over conveyor belts. Continuous, automatic, extremely accurate — Conveyoflo is installed right in your present conveyor, or can be furnished as a separate, self-powered conveyor and scale unit. Capacity is limited only by the capacity of the conveyor belt itself.

EXCLUSIVE FEATURES

- Accurate . . . within ± ½ of 1% of actual weight from maximum to 50% of meter's rated capacity; within 1% from 50% to 25% rate; within 2% from 25% to 10% of rated capacity.
- Automatic totalizer compensation for variations in belt speed and changes in belt weight.
- Responds accurately to rapid load variations.
- Paces auxiliary equipment (feeders, controllers, continuous blending processes, etc.) and operates secondary instruments.

Write for Bulletin 550-H4. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 391 Harris Avenue, Providence 1, Rhode Island.

BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC.
METERS FEEDERS CONTROLS

CZECHOSLOVAKIA

Russians are shifting the center of their uranium mining operations from the Erzgebirge, the mountain range along the Saxony-Czechoslovakian border to Thuringia.

Ore deposts of Thuringia are high grade and easy to exploit, according to a West German government survey. Richest Thuringian deposits are at Katzendorf and at Sorge-Settendorf, near Gera.

Katzendorf mines are said to cover an area of about 500 acres. Thick layers of ore reportedly lie 12-60 ft below the surface. At Sorge-Settendorf, some 1800 tons of ore are produced daily, the survey said.

Erzgebirge mines have been called the richest uranium mines in Europe. Apparently most of this ore already has been shipped to Russia because the 75% of the mining area, heretofore fiercely guarded, has been opened to the public. Area now open to the public is in the Annaberg, Marienberg and Zschopau Districts. At the same time, safety measures of the MVD, secret Soviet police, have become more stringent in the remaining mining area.

Remaining Erzgebirge mines are in a 20 mi long valley formed by the Schwartzwasser River between the towns of Aue and Johanngeorgenstadt. Some 130 pits line the river banks.

Some 86 Erzgebirge pits are in the Oberschlema and Schneeberg Districts. These pits reportedly range in depth from 250-900 ft. In this area, priority is given to the district of Breitenbrunn-Johanngeorgenstadt, site of the Soviet's top-secret "Project 338." Troops numbering some 10,000 hand-picked men guard this area.

Erzgebirge mining operations are said to be run by the Russian geologist, Kotelnikov. Workers receive extra food rations.

SPAIN

Compania Minero y Metallurgica Los Guindos, S. A., reported that the production of lead in Spain during 1953 was 54,784 metric tons as compared with 43,112 metric tons in 1952.

Of this tonnage, 22,985 tons were exported in 1953 compared with 17,053 tons in 1952. The national economy absorbed 23,582 tons of new lead in 1953 against 26,451 in 1952.

Compania Eloy Celdran Conesa at Cartagena is now operating two flotation plants. One plant, at the Santa Teresa group of mines, is producing 450 tons of lead concentrates and 800 tons of zinc concentrates monthly.

In addition, the Balsa y Depositaria plant is producing 100 tons of lead concentrates and 150 tons of zinc concentrates monthly. Also, a sink-float plant is under construction at each of the two groups of mines.

The Teresa gravity plant is to have a capacity of 150 tons of ore daily and the Balsa y D. plant, 200 tons daily, it was reported.

ACME STOPER

JUMBOLTER

installs roof bolts three times faster

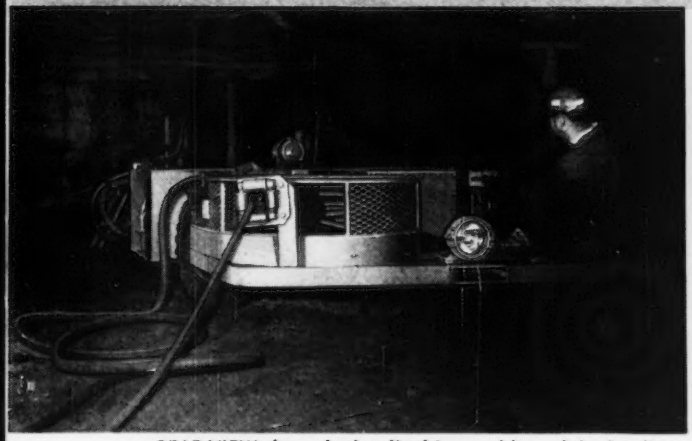
Acme's Stoper Jumbolter is the mine operator's biggest time and money saver since the first stoper. Typical performance: With Jumbolter, two men can complete in 15 minutes a job that used to take three men with hand stopers 45 minutes. Another mine operator reports 210 42" roof bolts installed in one 6½ hour shift with Jumbolter!

With the stretch of an octopus, Jumbolter's air-articulated arms reach out 9 feet, swing in 270° arc . . . bolt an area 23' 10" wide without moving machine.

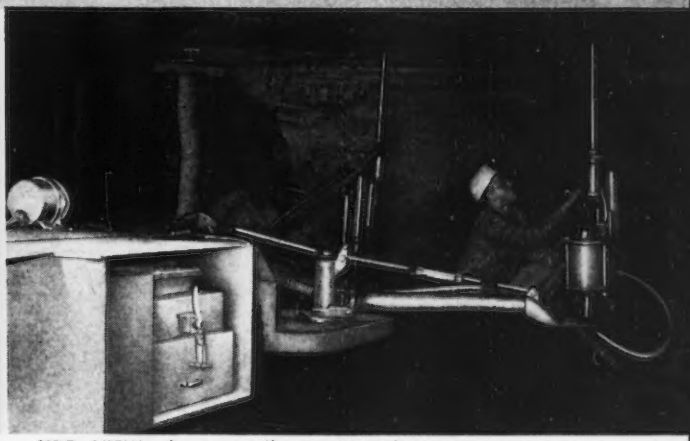
Jumbolter's performance figures show how roofbolting can be the fastest part of the mining cycle, how tonnage is increased and cost-per-ton lowered.

Revolutionary new dust collectors

Jumbolters are equipped with LeRoi-Cleveland stopers which feature new tube-type, suction dust collectors approved by the Bureau of Mines. They save time . . . are easy to service. No jacks or arms to set up — no separate units required.



REAR VIEW shows hydraulic-driven cable reel, hydraulic tramming and steering controls. Operator has ample deck room (42" x 42").



SIDE VIEW shows easily positioned stoper arms. Storage space is provided for 150-200 bolts, nuts and plates.

Write or call today for details on how Jumbolter can triple your roofbolting production.

BUREAU OF MINES APPROVED!

Jumbolter has Bureau of Mines Approval Number 2-1002. Overall height of 30" permits bolting of 36" ceilings. Telescoping stopers can bolt 9 foot ceilings. Adapt the LeRoi-Cleveland stopers you now use to the new dust collecting system with a conversion kit. Jumbolter is 178" long, 88½" wide . . . ground clearance is adjustable from 6 to 9".

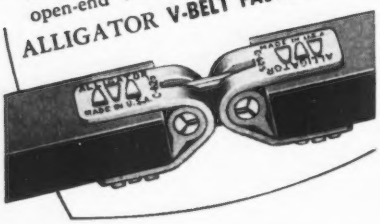
ACME Machinery Company

WILLIAMSON, WEST VIRGINIA • PHONE 2274

(Continued from p 128)

WHICH V-BELT is best for you?

If the correct size of endless V-Belt is not readily available, or if you have to tear down machinery to install, then the best belt to use is open-end V-Belting fastened with ALLIGATOR V-BELT FASTENERS



★ In this way you can make up V-Belts in *any length* to fit *any drive* the fast economical way — V-Belts that perform exceptionally well.

★ In contrast to link-type belts these ALLIGATOR fastened V-Belts have just *one* strong joint . . . *stretch and follow-up maintenance are reduced to a minimum.*

ALLIGATOR INTRODUCTORY V-BELT DRIVE UNITS contain V-Belting, Fasteners and Tools — everything you need in one compact package to make up V-Belts quickly. Available in sizes A, B, C & D.

Ask for Bulletins V-215 and V-216
Order From Your Distributor

FLEXIBLE STEEL LACING COMPANY
4635 Lexington Street, Chicago 44, Illinois

ALLIGATOR
V-BELT FASTENERS

Stephens-Adamson Mfg. Co. (136) R. C. Pierce. Be sure to see the new "220 Series" Simplex belt conveyor carriers with new spun end roller design and one piece welded steel frame, plus heavy duty manganese steel feeders, vibrating conveyors, Redler conveyor elevators, roller type holdback and spring type belt cleaner.

Stoody Co. (2119, 2121, 2123) A. W. Anderson. Actual welding demonstrations of the Stoody Magnecote process, an adaptation of the semi-automatic welding machine to use magnetic alloy fluxes.

Thomas Flexible Coupling Co. (1117) Thomas, manufacturer of the famous Flexible Disc Rings, runs this show.

Thor Power Tool Co. (827—831) B. H. Johnson. The Thor people would like you to feast your eyes on their new two-boom mining jumbo, completely powered and controlled by air. One boom will mount a Thor 3½-in. power feed drifter, the other a Thor air bar feed with 3-in. drifter.

Timken Roller Bearing Co. (822) W. G. Turner. A cool $35,000 in rock bits will be on display including the company's carbide insert and multi-use bits.

Tool Steel Gear and Pinion Co. (1024) J. C. Seeger. Depth and degree of hardness of the mining parts manufactured by Tool Steel Gear and Pinion will be graphically illustrated by cutaway sections of the various types of parts, including those used in mining machines and locomotives.

Tractomotive Corp. (265) J. T. Skinner. Making its bow this year is the TL-12, one yard, 4-wheel drive Tractoloader. Also on hand will be the TL-10, a 2-wheel drive, ¾-yd unit.

Traylor Engineering and Mfg. Co. (615) C. H. Roberts. Cutaway view of a large gyratory crusher will be the focal point of this booth's decor. There will also be photo enlargements of converters, ball mills, roll crushers jaw crushers.

Twin Disc Co. (142) P. G. Tyrrell. Featured here is a transparent working model of the Twin Disc 3-stage hydraulic torque converter, for heavy construction machinery and off-highway trucks.

W. S. Tyler Co. (1008) Bryant Currier. Main feature will be the latest model Ty-Rock screen. Samples of woven wire screens of different metals and meshes, and testing sieves with Ro-Tap shaker will complete the exhibit.

Union Wire Rope Corp. (914) R. B. Boand. Mr. Boand and his colleagues want to show you how to save money with the Tuffy line of slings, slusher rope, hoist lines, scraper, drag and dozer ropes, and 18x7 non-rotating rope.

United States Rubber Co. (2020) H. E. Dadson. Here's a chance to see a genuine Belt Surgeon at work, making "on the spot" splices on conveyor belts. Also on hand for your inspection will be the company's complete line of products; conveyor belts, V-belts, Uscolite plastic pipe, packing, tape, hose, pinch valves.

Varel Mfg. Co. (2115) T. Jack Brown. Rotary, cone-type rock bits from 2⅝-in. diameter through 12¼-in. will be on display.

Vacoloy-Ramet Corp. (400) R. C. Moore. All the Vacoloy-Ramet tungsten carbide mining tools will be here.

Victaulic Company of America. (1026) R. W. English. Victaulic's unique method of piping will be displayed with couplings from ¾ in. through 60 in. on display plus an assortment of other fittings. You'll also see Vic-Groover portable tools featuring automatic groove positioning and depth control.

Waukesha Motor Co. (156, 158) A. G. Mu'key. Turbosupercharged truck and industrial diesels in the persons of the 426-in. displacement, 185 hp Model 135-DKBS and the 1197-in. turbocharged Model WAKDBS, will be on display.

Weatherhead Co. (2000) Ralph Conrad. Features here will be industrial hose and reusable couplings, CS-10 hose cutting and skiving machine, HD-1 hose and coupling easy storage unit, Ermeto flareless steel tube fittings, and brass tube and fittings.

HOW PQ® SILICATES IMPROVE FLOTATION

- Raise fluidity of high solid slurries
- Condition mineral surfaces
- Aid separation
- Keep siliceous particles in suspension
- Increase recovery

Get more information on how silicates can help your operations. Free test samples on request.

PQ® Silicates of Soda
METSO® DETERMENTS

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DETECT URANIUM DEPOSITS
100 TIMES EASIER!

WITH THE PRECISION SPECIAL® SCINTILLATOR"

DEALERS WANTED

Here is the ideal field instrument for Uranium prospecting. It's ultra-sensitive, low in cost, lightweight and small in size.

The model 117 "Special Scintillator" is made by Precision Radiation Instruments, Inc., manufacturers of the famous Model 111 "Scintillator."

Contact your nearest dealer or write direct for free complete catalog on instruments for detecting Uranium and other metals.

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Please send Free Catalog.
Name_____
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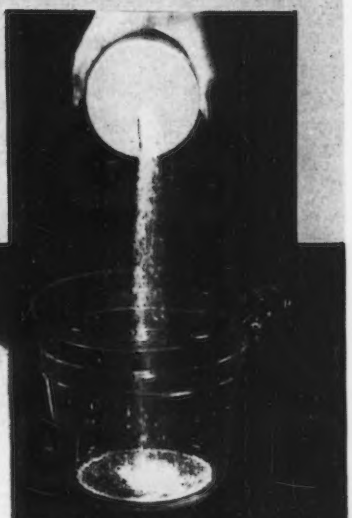
WORLD'S LARGEST MANUFACTURERS OF PORTABLE RADIATION INSTRUMENTS

WEST END 58% SODA ASH is NON-DUSTING

...when we ship it –
...when you use it!



Like this quality table salt, West End ash is uniform in particle size . . . non-dusting and free-flowing.

West End's unique classifying system . . . a combination of air-separation and screening . . . insures complete control of dustiness in the product. Excessively coarse particles are removed. By cutting dust loss to a minimum, West End gives added economy to every industrial process.

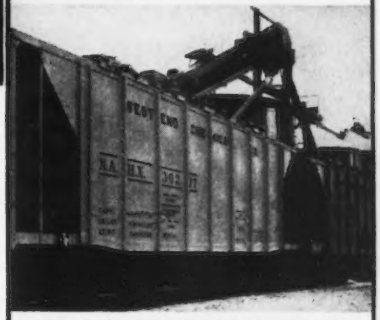
WEST END SODA ASH IS FREE-FLOWING

Air-separation gives West End ash exceptional uniformity of particle size and density resulting in outstanding free-flowing characteristics. This uniformity tends to prevent classification and caking under normal handling and storage conditions. When put into process, West End ash is non-dusting and free-flowing.

Write for samples, prices and technical data.

Orders Filled Immediately

Large stocks of soda ash are kept constantly in storage to fill all requirements promptly. West End's location provides the most rapid and economical shipment of soda ash available to users throughout the West.



West End's fleet of leased hopper cars is always ready to serve.

30 minute in-and-out loading for bulk trucks at any hour of day or night through "serve yourself" delivery.

WEST END CHEMICAL COMPANY

SODA ASH · F. M. SMITH BRAND BORAX · HYDRATED LIME

Executive offices: 608 Latham Square Building, Oakland 12, California · Plant: Westend, California

MINING OPERATORS USE McCarthy Drills

Heavy Rugged Powerful

AT Bessemer Limestone & Cement Co., Bessemer, Pa., one McCarthy unit (above) averages 90 ft. per hour, drilling through hard blue shale and sand rock 34 ft. deep. Blast holes are drilled on 18-ft. centers. Two men handle the whole job, including setup and moving. McCarthy drills operate with gasoline, diesel or electric power units . . . on all types of mounts. McCarthy "money-savers" can work for you. See your nearby distributor or write Salem Tool direct for further information.

SALEM THE SALEM TOOL CO.
803 S. ELLSWORTH AVE.
SALEM, OHIO · U. S. A.

Wedge Wire Corp. (3108) Joseph E. Parker. Stop by and pick out the Wedge Wire screen that fits your problem from the samples in different metals, openings and wire profiles.

Western Gear Works. (122) Ray Conlisk, James Fowler. Basic line with Western is speed reducers. They'll spotlight the exhibit with transmission gear boxes, speed increasers, high speed units, gear motors, torque converters, right angle drives and open gearing.

Western-Knapp Engineering Co. (731) Charles Skinner. Stop in here to get the exciting story of plan-to-mill operation. Sketches, drawings, photographs and illustrations of engineering and construction projects completed by Western-Knapp in the past several years will be featured.

Western Machinery Co. (723-27) W. H. Newton. The new Wemco solids pump is the star here with an operating lucite model and a cutaway assembly of a commercial unit. Supporting cast includes a 24-in. diameter SH classifier in operation, a lucite model of a drum-type heavy media separator, a 44-in. Fagergren cell with a glass front in operation, a new style diaphragm pump, and a laboratory attrition machine in operation.

Western Rock Bit Mfg. Co. (458) Maurice W. Hawkesworth. Exhibited will be all styles of the Liddicoat bit which is "used to distruction and then discarded." A McGee-Hogan grinder for preparing drill steel for the Liddicoat bit will demonstrate the ease of rod preparation.

Westinghouse Electric Corp. (715-719) R. T. Ervin. Stand by for a phonomimic presentation (whatever that is) of the company's Sunnyvale plant facilities. On display will be the new Life-line "A" motor and dc sectionalizer as well as control centers, gearmotors, and special slusher hoist motor.

Henry Wild Surveying Instruments Supply Company of America, Inc. (2004) H. P. Tanner. Browse around precision theodolites with their various accessories for mining use, precise levels, single and double pentagonal prisms, and stainless steel precision drawing instruments.

Yuba Mfg. Co. (3000) G. J. Maggioli, P. C. Carmer. See a two-cell M-8 Mineral Jig in operation and a 10-hp Yuba-Schrock motorized pulley for earth moving and heavy conveying systems. Belt speeds range from 75 fpm upward.

Lavender Pit

(*Continued from p 144*)

to a 125-ft diameter thickener with the underflow being sent to the filter plant. Tailings from these cells is combined with rougher concentrate and is sent to the regrind section.

The regrind section consists of four 8 x 12 ft ball mills in closed circuit with one 54-in. twin spiral classifier. The overflow from the classifiers is piped to a 125 ft diameter thickener for dewatering before being returned to the rougher flotation section.

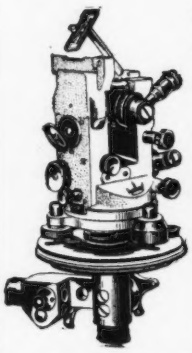
In the filter plant there are five 12-ft x 18½-ft drum type filters.

Water reclaimed from the tailings dams is pumped back to the mill by three 500 gpm centrifugal pumps through a 10-in. line. Make up water is supplied by the underground mine.

In addition to the construction of the crushing plant, concentrator an allied facilities, additional power generating equipment was installed in both the Bisbee and Douglas power plants, and considerable construction work was necessary at the smelter in Douglas for handling the additional tonnage.

ASKANIA

MINING THEODOLITE



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EASY
EFFICIENT
PRECISE
LOW PRICE

Reading 1' Estimation 6"

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SCINTILLATION COUNTERS

FIND URANIUM 100 TIMES EASIER

MODEL SC-8 (pictured above) $495.00
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FAMOUS HALROSS SCINTILLOMETER, MODEL 939 . . . . $975.00
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ALL TYPES GEIGER COUNTERS
ULTRA VIOLET LIGHTS
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LONG PROBE SCINTILLATION AND GEIGER COUNTERS FOR DRILL HOLES

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The oldest and most experienced supplier of Scintillation Counters in the United States.
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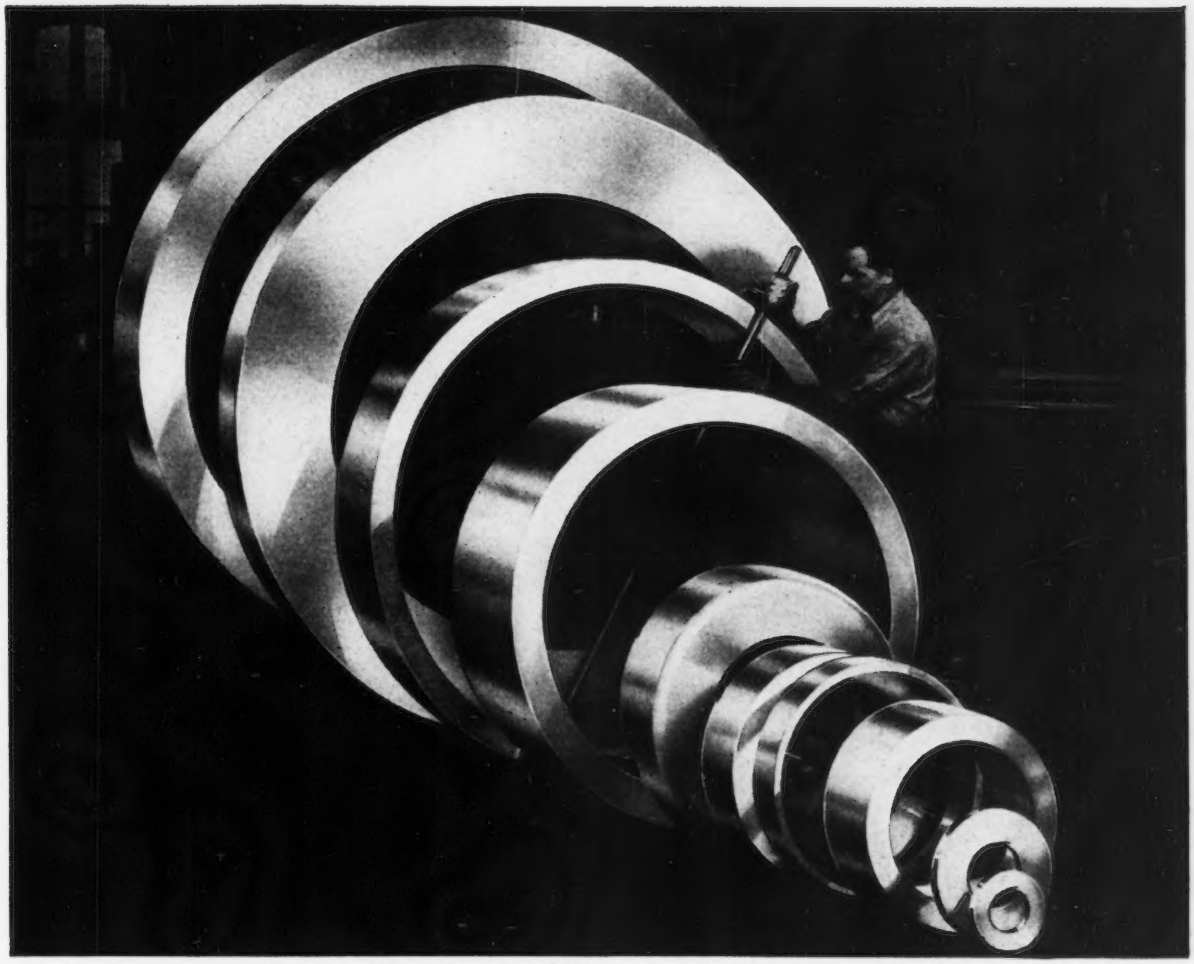


A *Ring* OF *Extra Service* IN EVERY ONE

Rings for turbine reduction gears . . . thrust rings for bearing raceways . . . die rings for mills . . . Midvale craftsmen make them all. From the smallest ones of a few inches in diameter to one hundred eighty-five inches, from twenty pounds to twenty thousand pounds they are quality-controlled in every step.

Each Midvale ring is exact in metallurgical specifications because of the experienced steel making practices and complete open hearth and electric furnace facilities of Midvale. Rings are carefully shaped by craftsmen with years of forging and rolling skill. Heat treated in temperature controlled furnaces to assure wearing qualities that will withstand the severest friction, abrasive, crushing and grinding action.

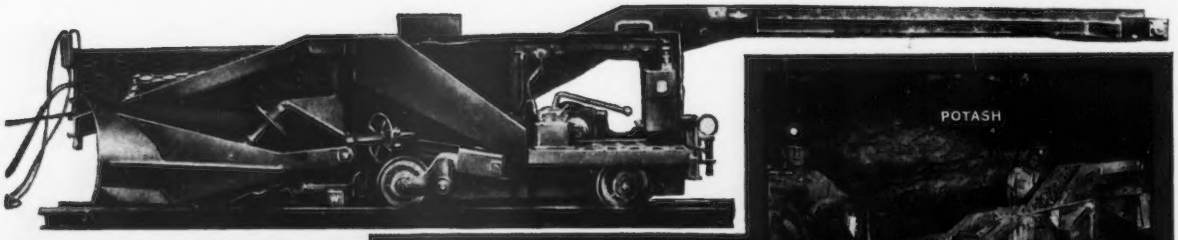
This is why Midvale rings are noted for their long life . . . why gear makers order Midvale blanks . . . why Midvale rings and roll shells are used on the toughest installations. The men of Midvale working with the right equipment and facilities offer you a source of rings, rolls and forgings unsurpassed in quality and extra performance.

THE MIDVALE COMPANY- Nicetown, Philadelphia 40, Pa.

Offices: New York, Chicago, Pittsburgh, Washington, Cleveland, San Francisco

MIDVALE

FORGINGS, ROLLS, RINGS, CORROSION AND HEAT RESISTING CASTINGS



cleans all mines..

The dependable Canton Track Cleaner . . . backed by 50 years' mining experience has demonstrated remarkable savings, proven by actual operations in many types of mines, nation-wide.

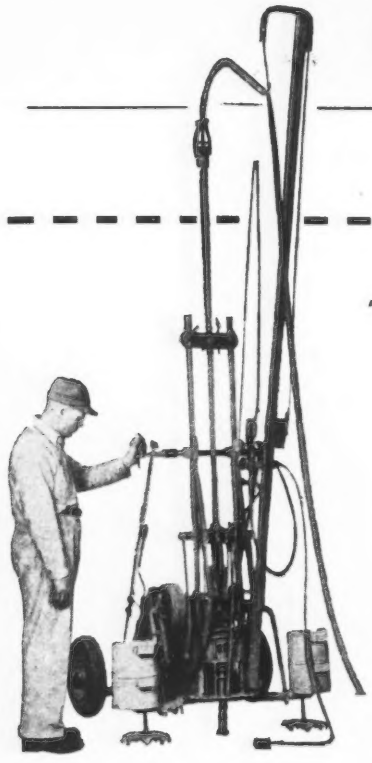
Canton Quick-on Cable Splicer

Make an on-the-job cable splice. Practically no down time. No special tools required. Just pound around meshed cable ends.

American Mine Door Company
2039 Dueber Ave., Canton 6, Ohio

Write using street and zone number

Cut Prospecting Costs . . .



GET A Hossfeld *Direct Motor Drive* PROSPECTING DRILL

- Powerful Direct Drive
- One Man Operation Throughout
- Economical 5 H.P. Air Cooled Engine
- Lightweight — Compact — Portable

"The Prospector's New Companion"

A Hossfeld Prospecting Drill will cut your drilling costs and give you accurate samplings of deposits as deep as 110 feet. Cuttings and water are brought up continually through the hollow drill steel by the bit check valve for assay at any time, with extremely little loss of water, cuttings or salting.

Hossfeld's "Churn" principle, using water to slush the cuttings, makes it possible to drill through various strata from loose or frozen top soil, mud, and slate, through stratas of hard rock. Equipped with pneumatic wheels, the Hossfeld Drill Operator can easily change drilling operations and move from hole to hole.

EASILY TRANSPORTED!
Total Weight: 1,300 lbs. with counterweights. Can be disassembled into 100# units in a very few minutes. Designed for trailer towing, it can be loaded into a half-ton pickup, or trailed in the field on its own chassis behind a car or truck. Or pull it with a burro!

Write today . . . for illustrated bulletin giving full details.

Manufactured By:
HOSSFELD MFG. CO.
434 W. 3rd St., Winona, Minnesota

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PROSPECTORS' EQUIPMENT
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HIGHER RECOVERY FROM LOW-GRADE ORES BY ION EXCHANGE

EXPANDING demand calls for the recovery of metals now *needlessly* going to waste . . . improved techniques for working lower grade, complex ores.

New Ion Exchange processes will play a big part in achieving these goals. For Ion Exchangers can pick up metals from dilute leaching or mine water solutions . . . return them as *10% concentrations*—at *low* cost. In fact, the more dilute the solution, the greater the savings over conventional processes.

METAL RECOVERY

Permutit Ion Exchangers are profitably at work recovering metals. A recent Permutit installation recovers copper from cuprammonium rayon wastes. Copper is present at only 25-40 ppm. Yet about a ton per day is recovered from waste water. Another plant is recovering zinc; several are recovering chromates.

Other applications range from purifying pickling solutions to the separation of rare earths in macro quantities.

Permutit is ideally equipped to work with your engineers in developing new Ion Exchange processes tailored to your needs. Only Permutit manufactures both Ion Exchange resins and equipment of all types—provides undivided responsibility for plant performance. Take advantage of our forty years of experience in Ion Exchange. Write today for full information on any Ion Exchange or water conditioning problem.

FREE TECHNICAL BULLETIN

Interesting, 16 page report on Ion Exchange suggests numerous new techniques for hydrometallurgy. It includes:

1. *Concentration*—Returns dilute solutions from mine waters or leaching as 10% solutions —at low cost.

2. *Separation* of mixtures of metals.

3. *Purification* of process or electrolyte solutions.

4. *Addition*—It is easy to convert salts to acids by Ion Exchange.

5. *Resin in Pulp*—Direct adsorption of metal ions by Ion Exchangers, followed by elution, promises considerable savings in investment, labor, pumping, loss to tailings.

MAIL COUPON TODAY!

IONAC PERMUTIT

REGISTERED TRADEMARK

ION EXCHANGE AND WATER CONDITIONING HEADQUARTERS FOR OVER 40 YEARS

THE PERMUTIT COMPANY, Dept. EMJ-9
330 West 42nd Street, New York 36, New York

☐ *Please send me Free Bulletin "Ion Exchange in Wet Process Metallurgy"*
☐ *I would like further information on*_____

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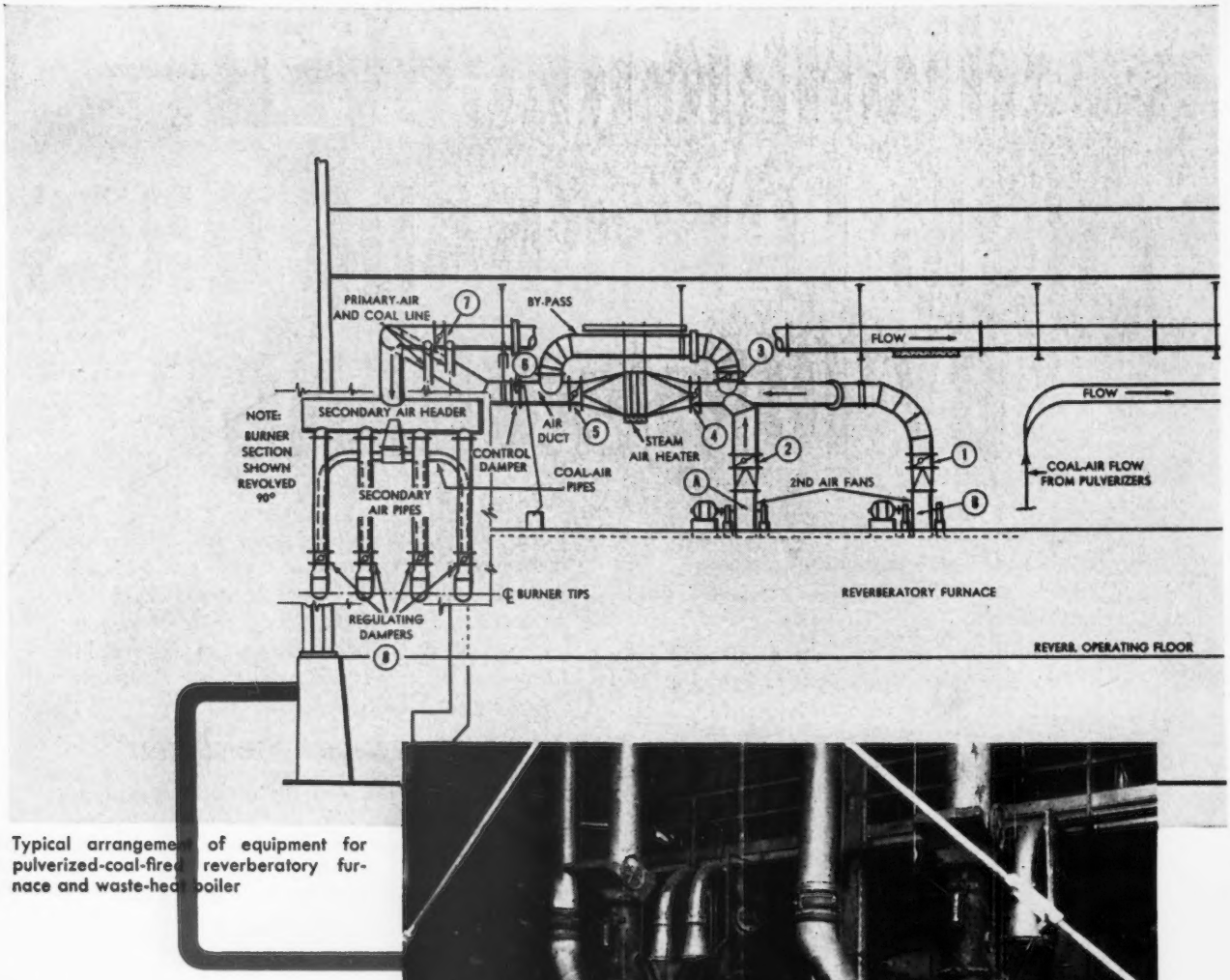
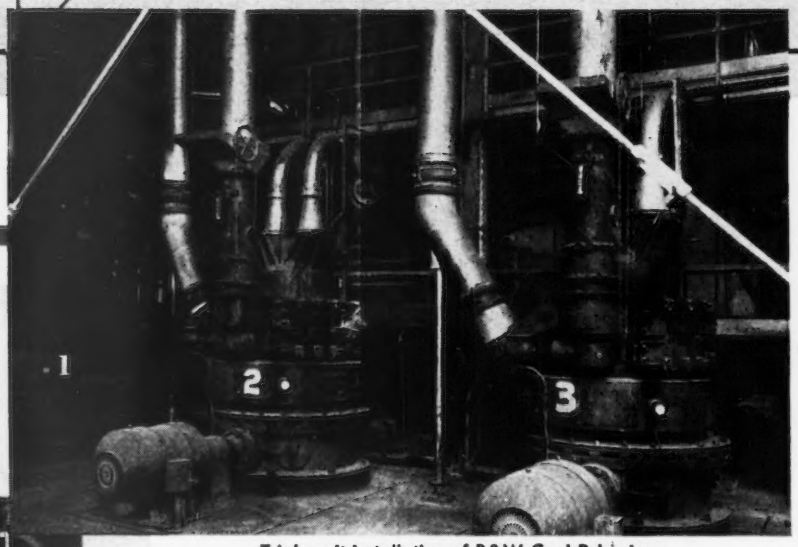
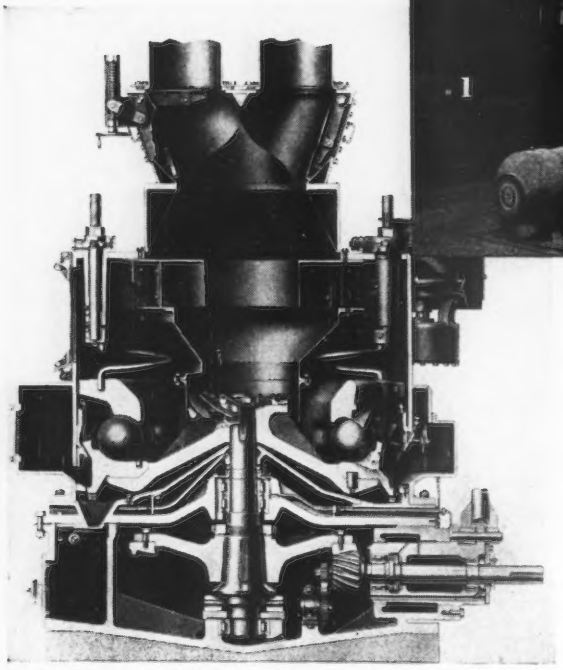
(In Canada, please forward to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.)



Typical arrangement of equipment for pulverized-coal-fired reverberatory furnace and waste-heat boiler



Triple-unit installation of B&W Coal Pulverizers

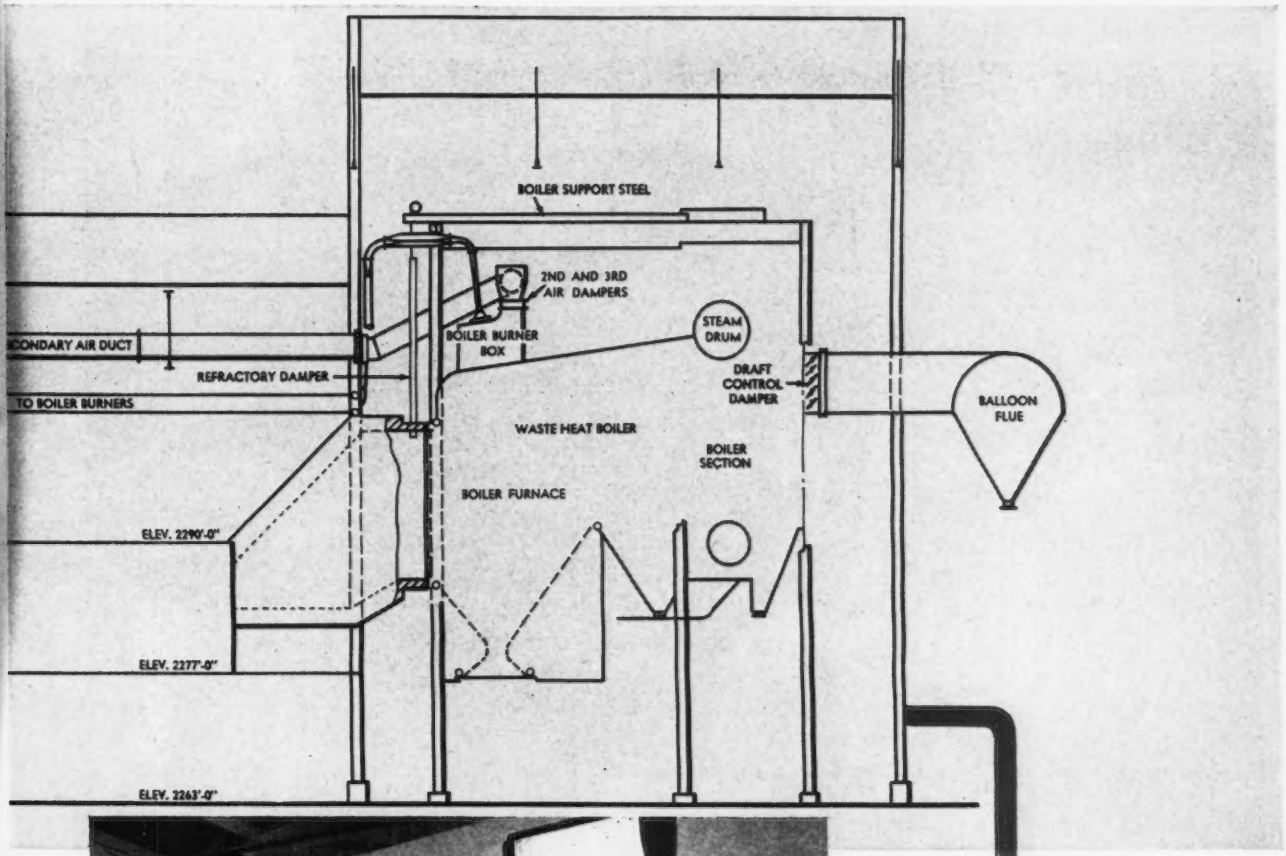


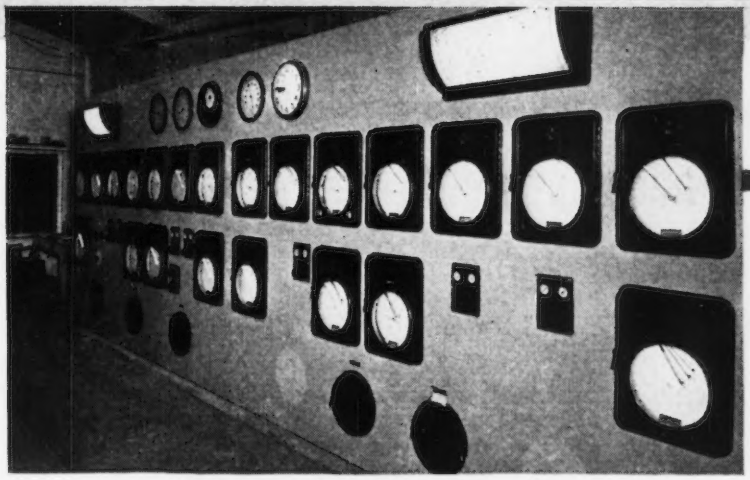
Cross-section of a B&W Coal Pulverizer

To Reduce Metallurgical

As a metal producer you know that one of the most effective ways to keep your over-all cost down is to use the most efficient, economical equipment available for your operations.

On the basis of in-service reports of metallurgical plants in Canada, the United States, and Mexico, B&W Pulverized-Coal Firing Systems and heat-recovery equipment have established a sound repu-





Control center for installation similar to above

Processing Costs...

tation for dependability and substantial economies in the processing of strategic metals, such as the recovery of zinc and lead from blast-furnace and reverberatory slags, and firing copper reverberatory furnaces.

Service-proved over many years, these B&W Systems are available complete (except for metallurgical furnaces) from raw-coal bins to heat-exchanger gas outlet, with fully automatic control. Write for details as they apply to your specific operations. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

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BOILER DIVISION

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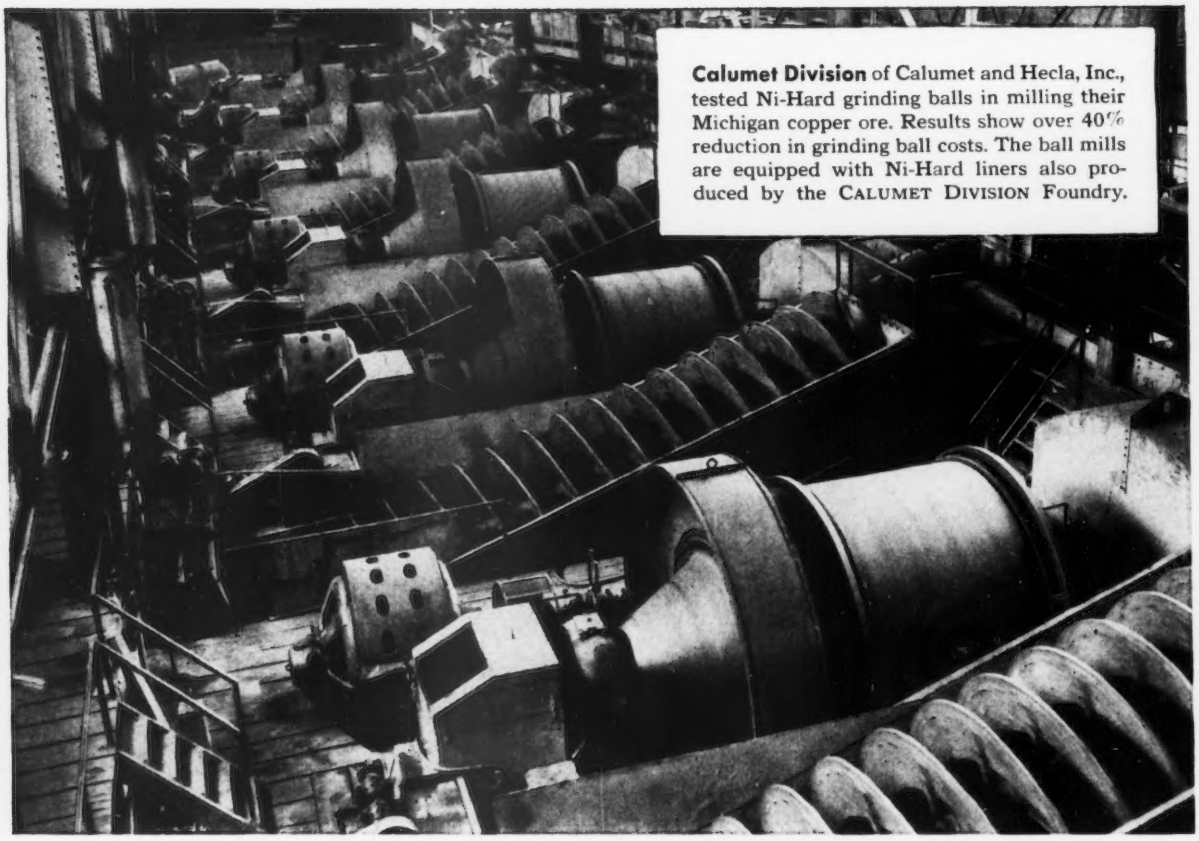


Calumet Division of Calumet and Hecla, Inc., tested Ni-Hard grinding balls in milling their Michigan copper ore. Results show over 40% reduction in grinding ball costs. The ball mills are equipped with Ni-Hard liners also produced by the CALUMET DIVISION Foundry.

CALUMET DIVISION Reports Ni-Hard Grinding Balls Provide

75% Greater Resistance to Wear

than Forged Alloy Steel

EVERY DAY these six ball mills grind about 500 tons of copper ore for the CALUMET DIVISION of Calumet and Hecla, Inc., Calumet, Michigan.

Ni-Hard grinding balls produced by the CALUMET DIVISION Foundry were used in comparative tests conducted in this battery of 8′ x 6′ conical mills. The test was designed to get to the meat of the problem . . . *the actual cost of grinding balls used per ton of ore ground.* When compared to forged steel and alloyed steel balls Calumet Ni-Hard grinding balls showed a cost reduction of over 40%.

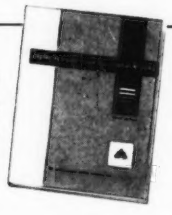
Feed to these mills is amygdaloid copper ore. Feed size is minus ¼″, and product size is minus 28 mesh, with about 50% through 200 mesh. Several sizing tests indicate an 8 to 10% increase obtained through 200 mesh by using Ni-Hard balls.

Wear ratios for a 10-month period are:

Forged steel	.53 lbs. per ton
NI-HARD	.30 lbs. per ton

It's easy to see how this superiority of 1.75 to 1 can help keep overhead down. To learn how Ni-Hard can be of help to you, write for "Engineering Properties and Applications of Ni-Hard." It's yours for the asking and the information it contains will certainly be of interest.

The completely revised third edition of "Engineering Properties and Applications of Ni-Hard" is now available. Write for your copy today.



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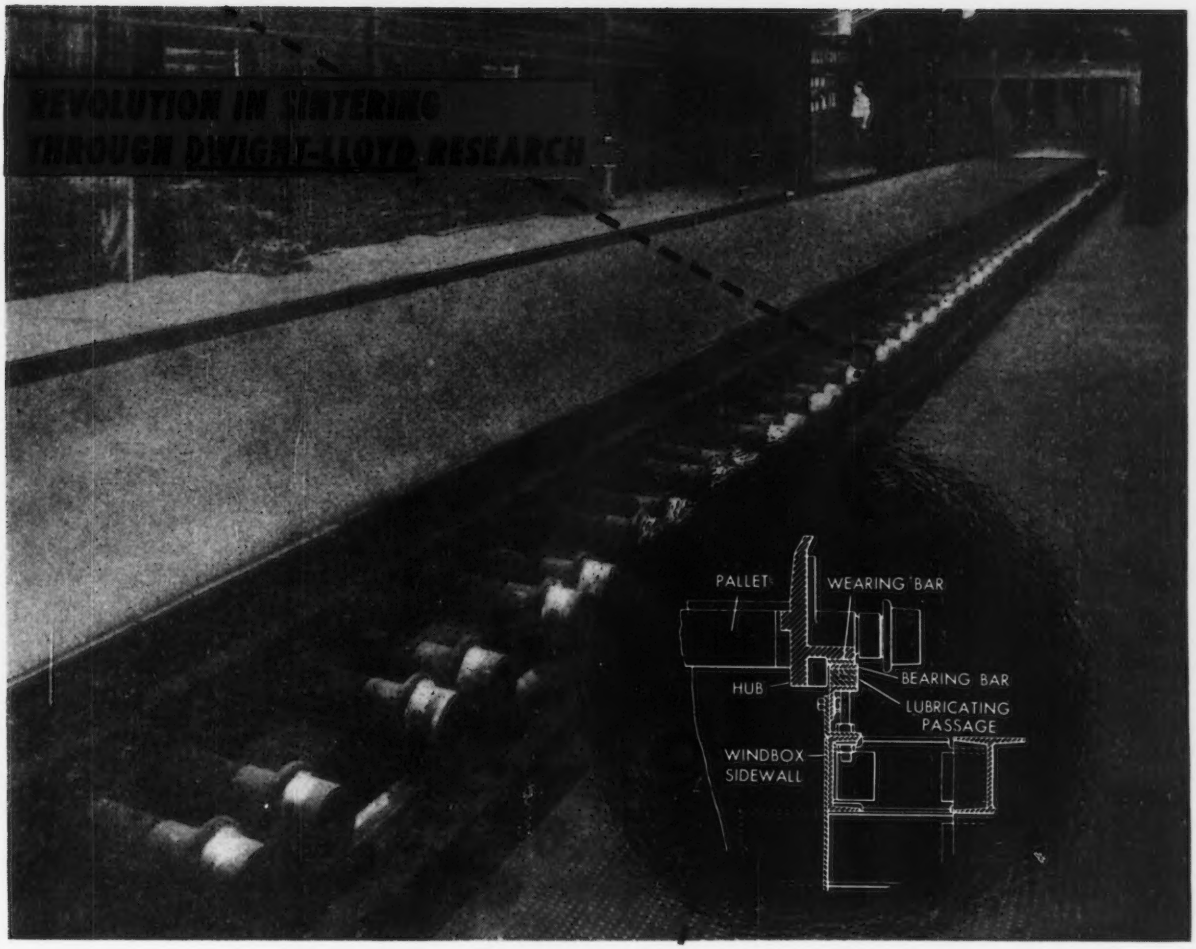
THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.



ROWEN WINDBOX SEAL HAS

Increased Production, Lowered Costs, Improved Product Uniformity

Increased sinter production, lowered costs, a more uniform product—these are the results with the use of the Rowen windbox seal* on the new Dwight-Lloyd sintering machines.

The seal completely eliminates air leakage between pallets and windbox. With it, the sinter at the edge of the pallets gets the same amount of air as the sinter in the center, greatly improving the uniformity of product. Production is also increased as the burning is more efficient and the operation is, therefore, faster. Operating costs are lowered because less air is needed to do the job and because the amount of return sinter is reduced.

The Rowen windbox seal is the result of years of intensive research by our engineers. It is another major Dwight-Lloyd contribution that has maintained Dwight-Lloyd sintering as a modern, economical process.

Among the other exclusive engineering achievements incorporated in the new Dwight-Lloyd machines are:

Upper windbox — permits up-draft or down-draft operation, adding great flexibility to installation. Can be used to: recirculate hot gases, reducing fuel requirements for the charge and also lowering plant heating costs.

*Compound discharge curve** — eliminates spillage, controls pallet drop, cuts pallet wear.

Roll feeders — assure an even distribution of charge on pallets.

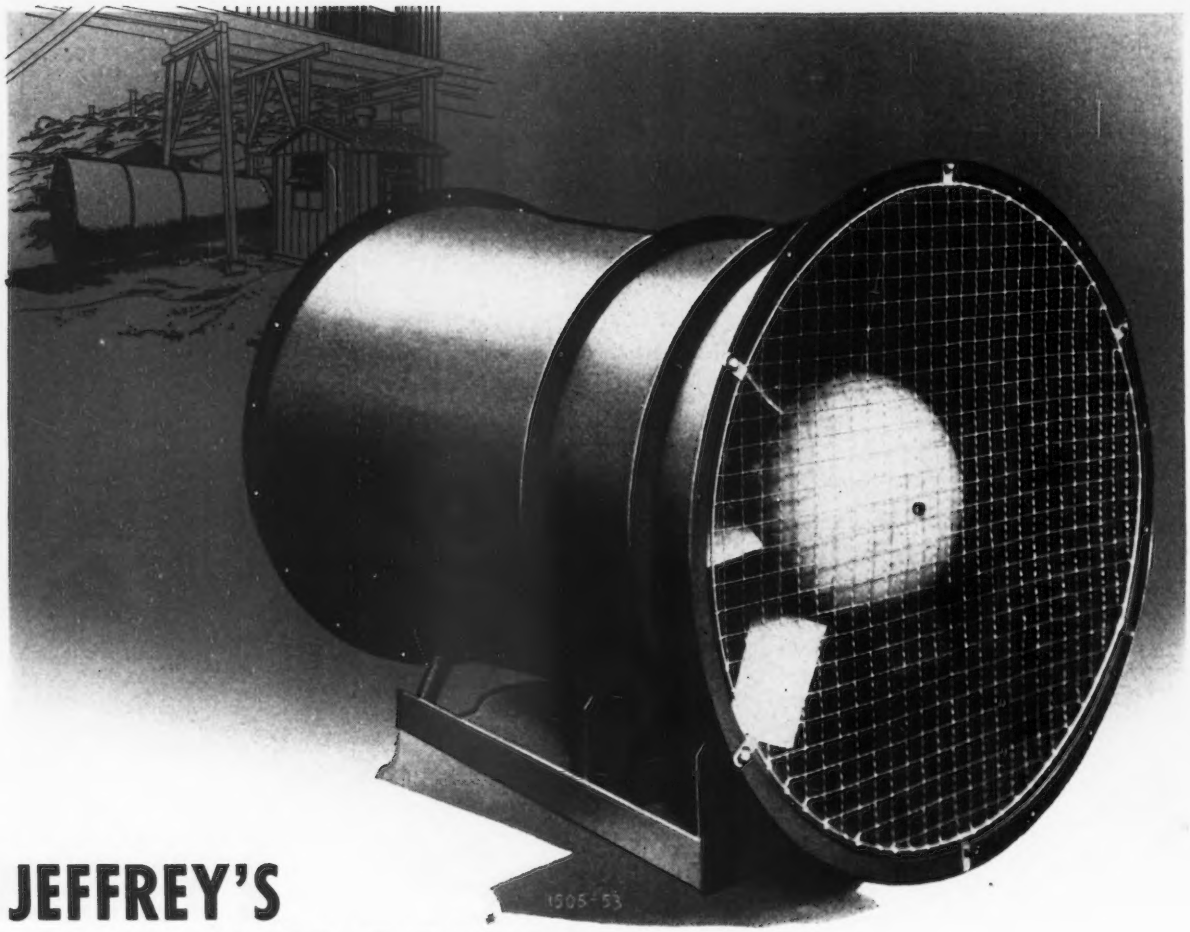
*Patented

Write for detailed information on the new Dwight-Lloyd sintering machines.

DWIGHT-LLOYD, Inc.

DIVISION OF SINTERING MACHINERY CORPORATION

120 Sinter Avenue, Netcong, New Jersey



JEFFREY'S new 6F AERODYNE FANS combine economy and efficiency

For light and medium-duty mine ventilation up to 5″ W.G. pressure, Jeffrey now offers the new, economical 6F Series AERODYNE Fan.

The 6F Series combines low cost with high efficiency. Many of the fine engineering features of the AERODYNE Series first introduced by Jeffrey in 1936 are incorporated in this new self-contained 6F Fan.

THESE FEATURES IMPROVE OPERATION:

- Universally adjustable blades made of cast-aluminum alloy and mounted on a solid aluminum alloy hub.
- Air reversal possible by reversing blade pitch or direction of rotation.
- Flange-mounted anti-friction bearings.
- Various lengths of expansion discharge for different duties.
- Overhung drive and fan wheel for belt drive up to 125 HP . . . can be direct-connected for higher HP ratings.

Learn more about the 6F Series – the fan with AERODYNE quality in the low cost field. Write to the Jeffrey Ventilation Division for details.

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA.

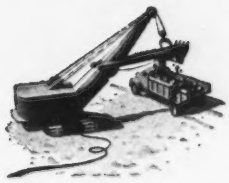
IF IT'S MINED, PROCESSED OR MOVED . . . IT'S A JOB FOR JEFFREY!

THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE

New! Improved! SUPER SERVICE
heavy duty portable cords and cables

...better
impact and crush resistance

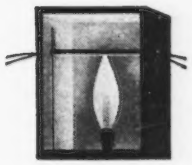
...better
tear resistance



...better
abrasion resistance
and tensile strength

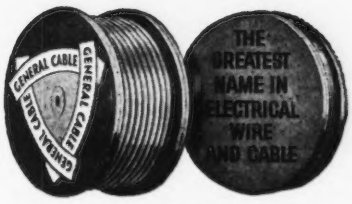
...better
flexing endurance

...better
resistance to kinking



...better
flame and heat resistance

...resists all your costliest hazards far beyond accepted field requirements!



BARE, WEATHERPROOF, INSULATED WIRES
and CABLES FOR EVERY ELECTRICAL PURPOSE

New SUPERTUF, General Cable's lead cured jacket on *new* SUPER SERVICE eliminates ply separation, resists crushing, tearing and abrasion. Special cord reinforcement within the SUPERTUF jacket gives extra tensile strength and longer cable life. In addition to meeting IPCEA specifications the new lead cured construction provides positive embossed product identification.

THERMAX heat resistant insulation gives top protection against temporary current overloads and extends the operating life of the cable. Flame resistance of the new SUPER SERVICE cable far exceeds requirements of the Federal Bureau of Mines.

New, more compact design prevents sleeving of the core from the jacket. Result: a well balanced product that performs better, lasts a lot longer, needs less replacement...costs no more! Why settle for less? See your friendly General Cable Representative today!

GENERAL CABLE CORPORATION

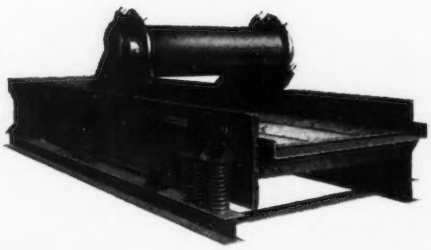
420 Lexington Avenue, New York 17, New York • Sales Offices: Atlanta • Boston • Buffalo Chicago • Cincinnati • Cleveland • Dallas • Detroit • Greensboro (N. C.) • Houston • Indianapolis • Kansas City • Los Angeles • Memphis • Milwaukee • Minneapolis • New York • Newark (N. J.) • Philadelphia • Pittsburgh • Portland (Ore.) • Richmond (Va.) • Rochester (N. Y.) Rome (N. Y.) • St. Louis • San Francisco • Seattle • Syracuse • Tulsa • Washington, D. C.

See us at Booth 130

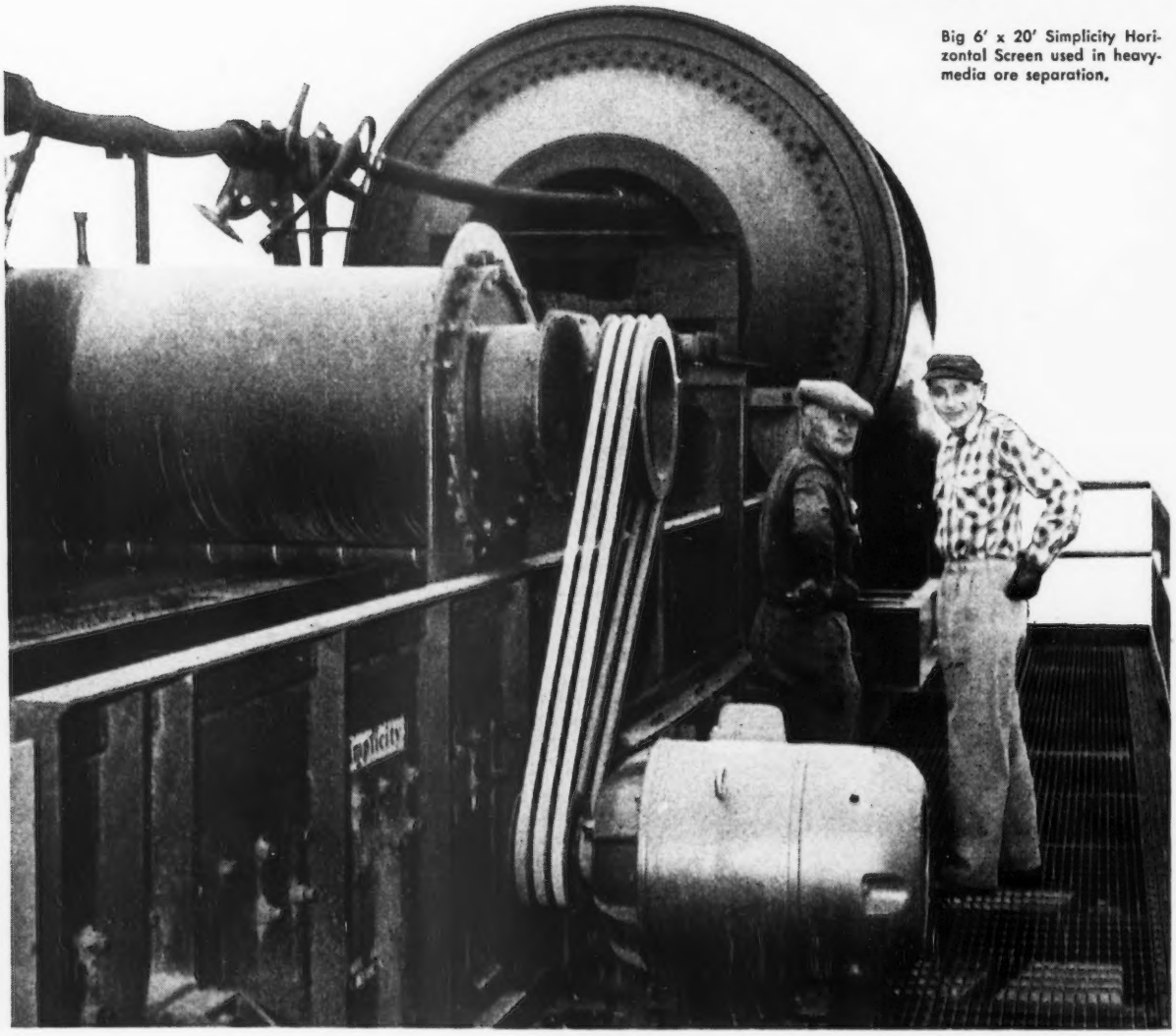
1954 Mining Show of the American Mining Congress
Sept. 20th thru 23rd • Civic Auditorium • San Francisco, California

Simplicity screens perform efficiently in heavy-media ore separation plants

Simplicity Horizontal Screens, built to perform efficiently even when headroom is at a minimum are in dependable daily operation in all phases of the mining industry. The Simplicity 6′ x 20′ Screen shown in operation in the photo is installed in a Michigan gravel plant for the production of improved gravel heavy-media separation. This is the same type of screen that has been used so successfully on the Minnesota iron ranges for dewatering and "sink-float" ore separation operations. This 6′ x 20′ unit, incidentally, is the largest of its type ever built. It's rugged and dependable and easily maintained. Complete shaft assemblies can be changed in 30 minutes time. For complete information about these screens and other Simplicity equipment, call your nearest Simplicity sales engineer or write us in Durand.



Big 6′ x 20′ Simplicity Horizontal Screen used in heavy-media ore separation.



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Sales representatives in all parts of the U.S.A.

FOR CANADA: Canadian Bridge Engineering Co., Ltd., Walkerville, Ontario

FOR EXPORT: Brown and Sites, 50 Church St., N. Y. 7, N. Y.

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND, MICHIGAN

Some Day... Maybe NOW...

You'll want these 2 yd. SHOVEL advantages!

When you need a 2-yard shovel, make sure the one you buy is a wise and sound investment. You'll be putting out important money for a machine that should make you money for years to come. Be sure you get the best. The Lorain-820 is a great 2-yard shovel, loaded with design features that mean easy operation, long life and more dirt or rock loaded at less over-all cost. The "820" is built to precision standards, quality is controlled every step of the way, performance is tested and proved. When the day comes for your big 2-yard shovel, remember all the things you get in a Lorain-820. Your nearby Thew-Lorain Distributor can show you why they mean more money in your pocket!

THE THEW SHOVEL CO., Lorain, Ohio

HERE ARE A FEW OF THE BIG VALUES IN THE LORAIN-820 . . .

☆ Center Drive concentration of engine power ☆ No-stall, non-shock Hydraulic Coupling power take-off ☆ Heavy, close-coupled design ☆ Self-equalizing Turntable rollers, mounted on roller bearings ☆ Hoist Drums on anti-friction bearings ☆ Internal expanding clutches with booster bands ☆ Hoist Drums may be "backed-down" ☆ 2-piece hoist brakes ☆ Interchangeable 2-piece laggings ☆ Swing Drums on anti-friction bearings ☆ Heat-treated, alloy steel gears ☆ Clutch linings precision surface ground ☆ Nickel cast iron clutch friction rings ☆ Air controls for crawler steering, for travel jaw clutch, for tread locking pawls, for crowd jaw clutch ☆ Air-assist on crowd and retract clutches for crowd, retract, crawler travel, boom derricking and lowering ☆ Independent crawler travel for simultaneous hoist, swing and travel ☆ 2-speed travel in both directions ☆ 4-way Tread-Travel lock ☆ Heat-treated, drop-forged treads ☆ Precision drilled tread-pin holes ☆ Heat-treated driving lugs and roller path ☆ Crawler 15 ft. 6 in. long x 11 ft. 4 in. wide ☆ 34 in. treads provide 10,930 sq. in. ground bearing area ☆ Positive, independent chain crowd ☆ Heavy, cross-braced, all-steel, all-welded shovel boom ☆ All-steel, all-welded dipper stick ☆ Drop-forged, heat-treated rack sections ☆ Spring-mounted "Green Horn" ☆ Adjustable, replaceable wearing strips in Shipper Shaft sleeve ☆ Power dipper trip ☆ Fully convertible from shovel to dragline, clamshell, crane or hoe, with many additional special features for these specific applications ☆ Diesel engine-powered ☆ Also available on rubber-tire Moto-Crane mounting.

SAVE THIS PAGE ★ CHECK THESE VALUES WHEN YOU BUY!

THEW LORAIN®

OFFERING MORE THAN 136 SHOVEL-CRANE COMBINATIONS ON CRAWLERS OR RUBBER-TIRES ...TO BEST FIT YOUR JOB FOR PROFIT!

LORAIN 820

SEND FOR CATALOG

See these Dodge products at the Mining Show, Booth 3111

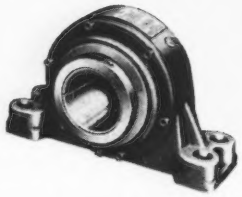
TAPER-LOCK SOLID STEEL CONVEYOR PULLEY

1 ***DRUM DESIGN***
—maximum strength
—minimum weight

2 ***FULLY ENCLOSED***
no dust—no dirt—no water

3 ***SUBMERGED-ARC PROCESS***
—full strength in all welds

4 ***TAPER-LOCK BUSHING***
—no walking on shaft
—easy on—easy off!

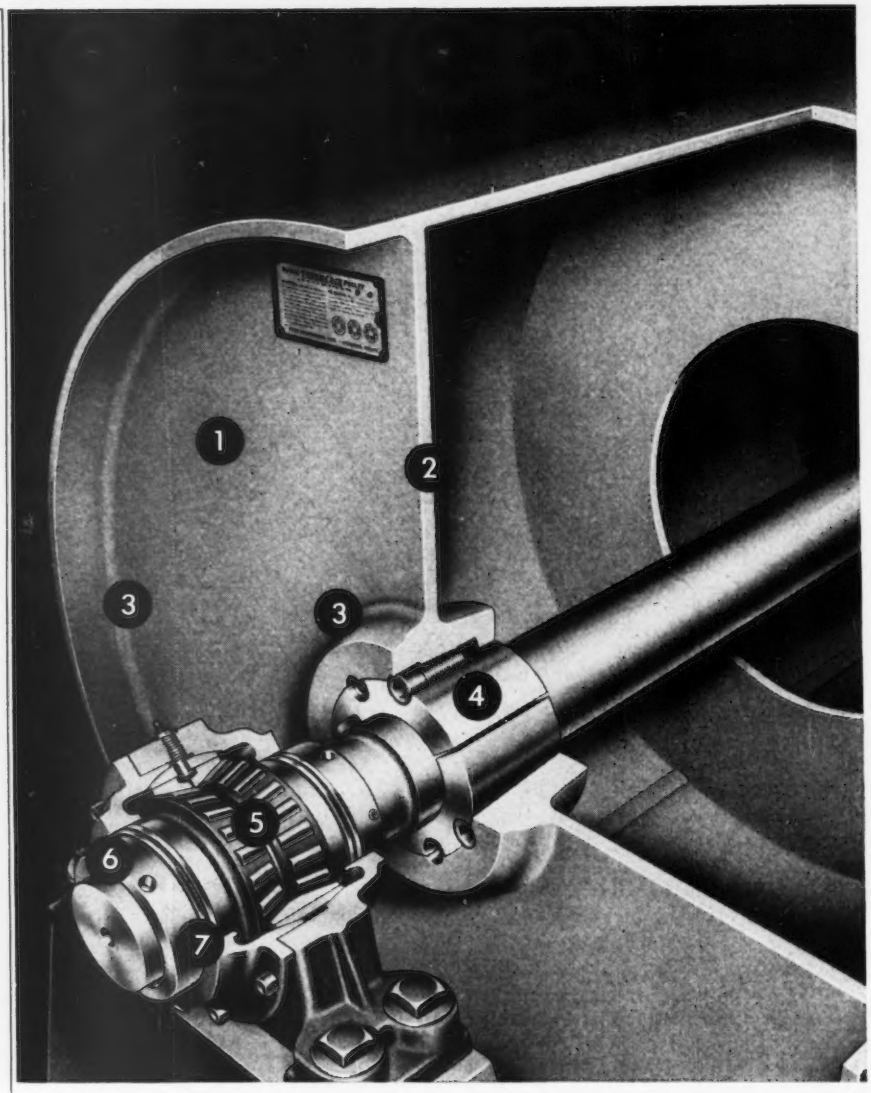


DODGE-TIMKEN ALL-STEEL PILLOW BLOCK

5 ***NEW HEAVY-DUTY TIMKEN ROLLER BEARINGS***
—fully self-aligning

6 ***HEAVY-DUTY ADAPTER MOUNTING***

7 ***Sealed both on and off the shaft with DOUBLE PISTON RINGS***



Here's a heavy-duty combination for tough conveyor jobs!

Pulleys from 6 in. to 8 ft. in diameter, all face widths. Bearings from 2 1⅞₁₆" to 10" bores. Popular sizes stocked by our Distributors. Write for detailed information.

DODGE

of Mishawaka, Ind.

Call the Transmissioneer, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

DODGE MANUFACTURING CORPORATION, 3100 UNION STREET, MISHAWAKA, INDIANA

an example: $10,000 saved with the new

AMSCO LEADER AUTOMATIC ELECTRIC WELDER

Pioneered by Leader . . .
Purchased by Amsco . . .
Proved by years of field use . . .

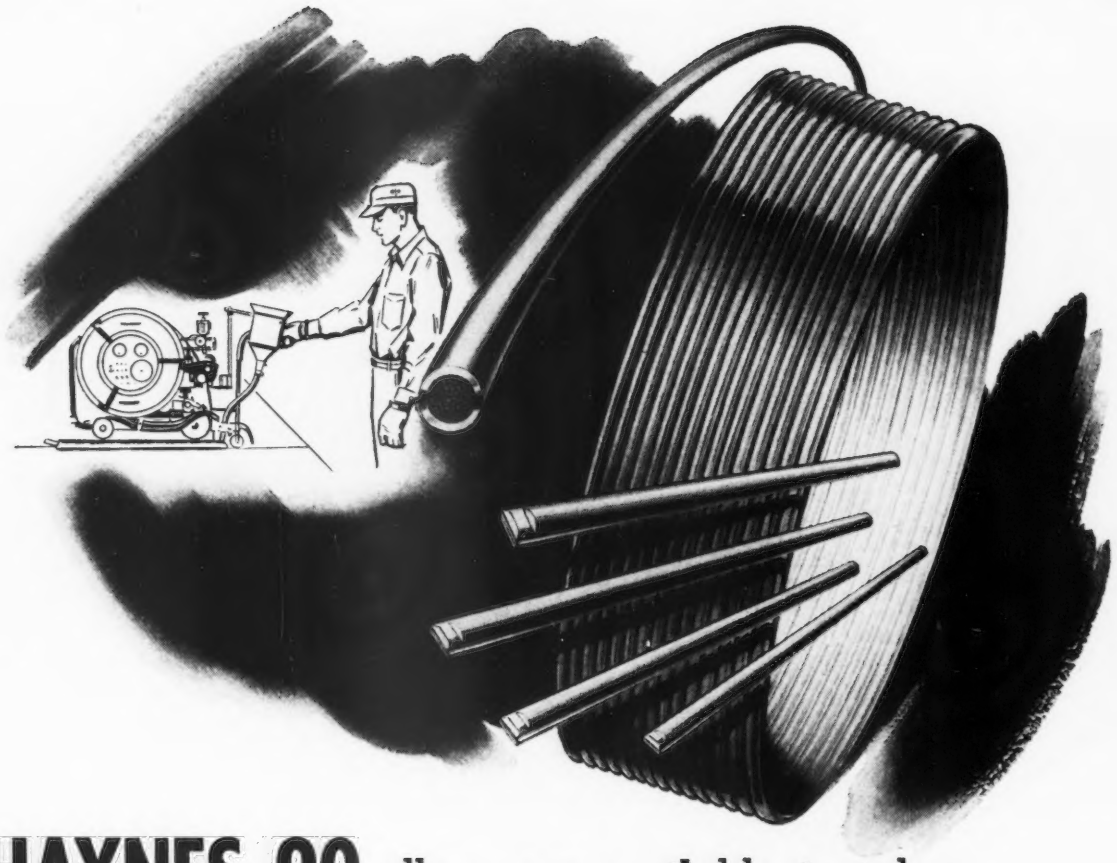
Maybe you've seen it work . . . know from firsthand experience the economies it effects. It's not new to mining and construction superintendents—*they proved it.* But in case you don't know about it, here's what it meant to one construction outfit.

Operating five large track-type tractors each with 12 bottom rollers, 4 carrier rollers, 156 track links, 78 grouser pads, 2 idlers, 2 sprockets and one dozer blade, replacement cost was figured to be approximately $13,800. Rebuilding these parts with the Amsco Leader cost approximately $3,700 or a saving of about $10,000. Plus the fact that the rebuilt parts gave nearly double the service life of new parts.

See your local Amsco Distributor, today. Ask him for complete details on the Amsco Leader. Ask for a demonstration. Take home the descriptive literature. See for yourself how a new Amsco Leader can save you thousands of replacement dollars.

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.



HAYNES 90 alloy now available in tubes and at a MUCH LOWER PRICE

TRADE-MARK

Now you can save even more by hard-facing wearing-parts with HAYNES 90 alloy. This is because HAYNES 90 costs so much less in this new economical tube form. These new tube rods produce sound, uniform deposits that won't crumble or flake off at temperatures up to 1000°F. They provide the same high abrasion, impact, and corrosion resistance—the same dependable protection for your equipment that HAYNES 90 brought to you as a cast rod—and at a much lower price.

For manual hard-facing, HAYNES 90 tube rod comes in convenient 14-in. lengths for easy application with standard metallic-arc welding equipment. For rapid coating of large parts, HAYNES 90 also comes in coils for mechanized hard-facing by the submerged-arc, inert gas, and open-arc methods.

HAYNES 93, HASCROME, and HAYSTELLITE alloys are also available in this economical tube rod form. HAYNES 93 iron-base rod is noted for high abrasion and corrosion resistance . . . HASCROME iron-base rod for high impact resistance . . . and HAYSTELLITE tungsten carbide rod is tops for resistance to severe abrasion.

Your local dealer carries a complete line of HAYNES hard-facing rods. Contact him for complete details. If you don't know the location of your local dealer, write to Haynes Stellite Company, a Division of Union Carbide and Carbon Corporation, Kokomo, Indiana.

See... Your local Haynes Stellite Dealer

or

Write... to Haynes Stellite Company

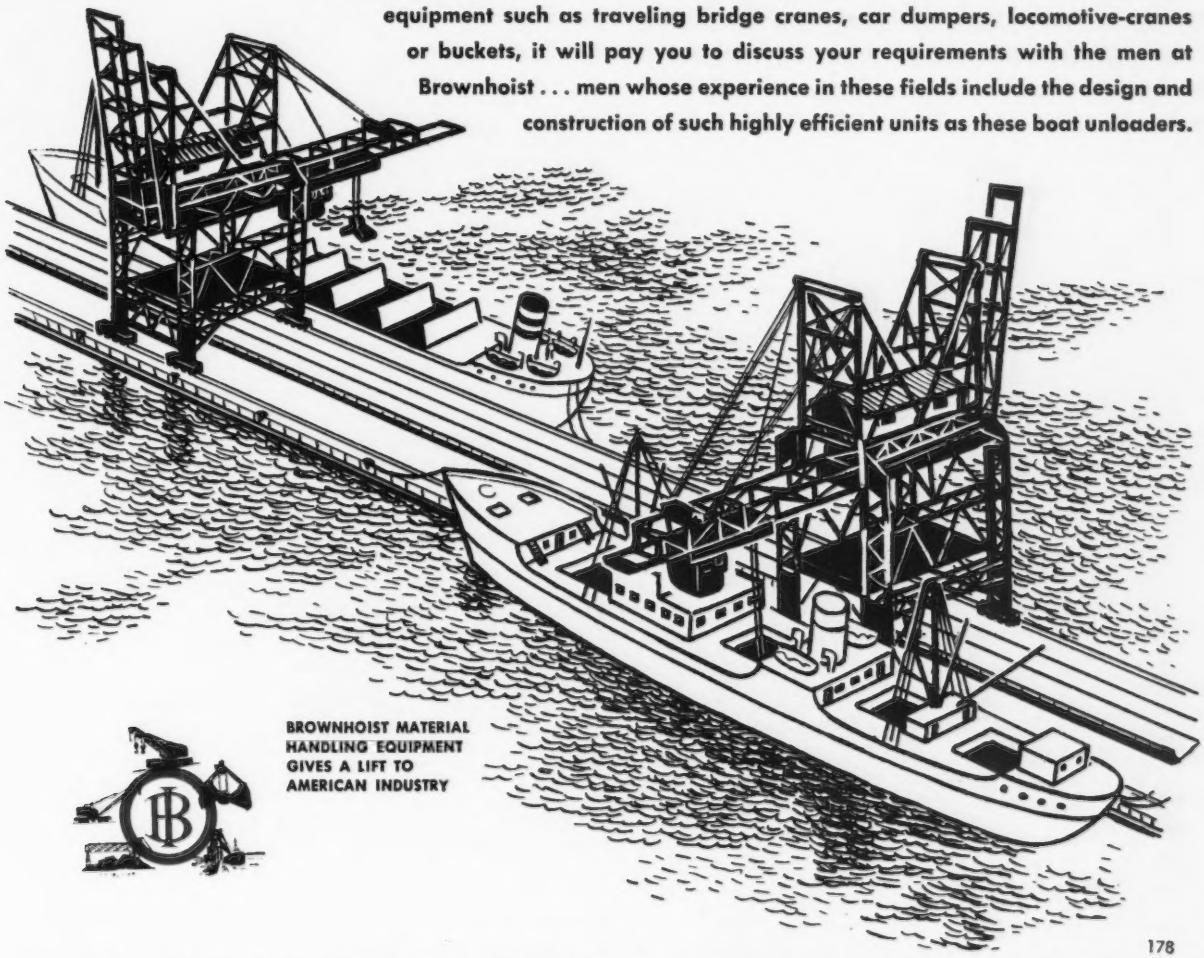
"Haynes," "Hascrome," "Haystellite," are registered trade-marks of Union Carbide and Carbon Corporation.

BROWNHOIST

ORE UNLOADERS handle up to 3600 tons per hour at the huge new pier of a large eastern railroad

Two Industrial Brownhoist Ore Unloaders, each with a free-digging capacity of 1800 tons per hour, provide this new pier for ocean-going ore vessels with the most modern and efficient unloading facilities in the United States. Towering over the pier like enormous drawbridges, the Brownhoist machines can travel the full length of the pier and lower apron extensions from either side to provide a reach 72 feet from the dock. Then huge buckets, capable of taking 25 tons of ore in a single bite, roll out on the aprons, return to drop their load into 100-ton receiving hoppers and roll back again for another bite. Elapsed time from bite to bite: just 45 seconds.

Whether your bulk materials handling operations call for ore unloaders or for other equipment such as traveling bridge cranes, car dumpers, locomotive-cranes or buckets, it will pay you to discuss your requirements with the men at Brownhoist . . . men whose experience in these fields include the design and construction of such highly efficient units as these boat unloaders.



BROWNHOIST MATERIAL HANDLING EQUIPMENT GIVES A LIFT TO AMERICAN INDUSTRY

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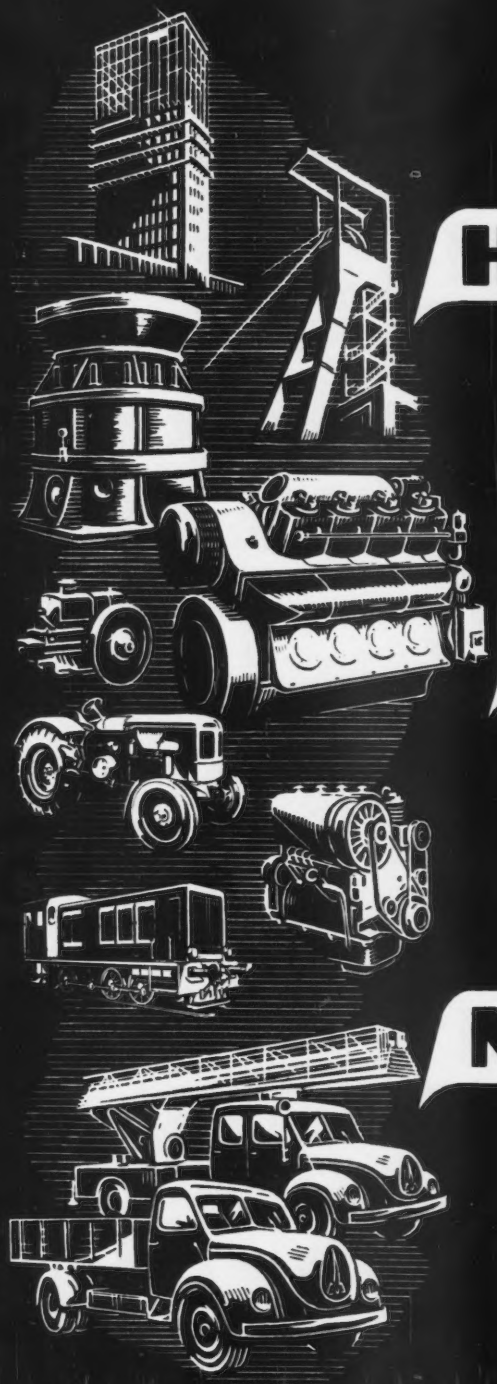
INDUSTRIAL BROWNHOIST CORPORATION • BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Cleveland, Chicago, Denver, San Francisco, Montreal • AGENCIES: Detroit, Birmingham, Houston



SINCE 1856

HUMBOLDT

Mines Equipment, Mineral Dressing Plants, Crushing and Grinding Machinery, Cement Factories, Metallurgical Works, Coal Preparation Plants, Steel Constructions for Buildings and Bridges.

SINCE 1864

DEUTZ

Otto-, Gas-, Diesel-Engines for Every Purpose of Two- and Four-Stroke design, Output range 3-1650 H.P. Cooled by water or air, Diesel-powered tractors, Diesel locomotives, Gas producer plants.

SINCE 1864

MAGIRUS

Trucks and busses driven by air-cooled DEUTZ Diesel engines, Vehicles for municipal services, Fire ladders, fire engines, Fire fighting water trucks, Two-wheeled ladders, Fire fighting equipment.

KLÖCKNER-HUMBOLDT-DEUTZ AG · KÖLN

Send inquiries to either Köln, Germany or Ulm, Germany

An Inside Story on...

Modern Roasting

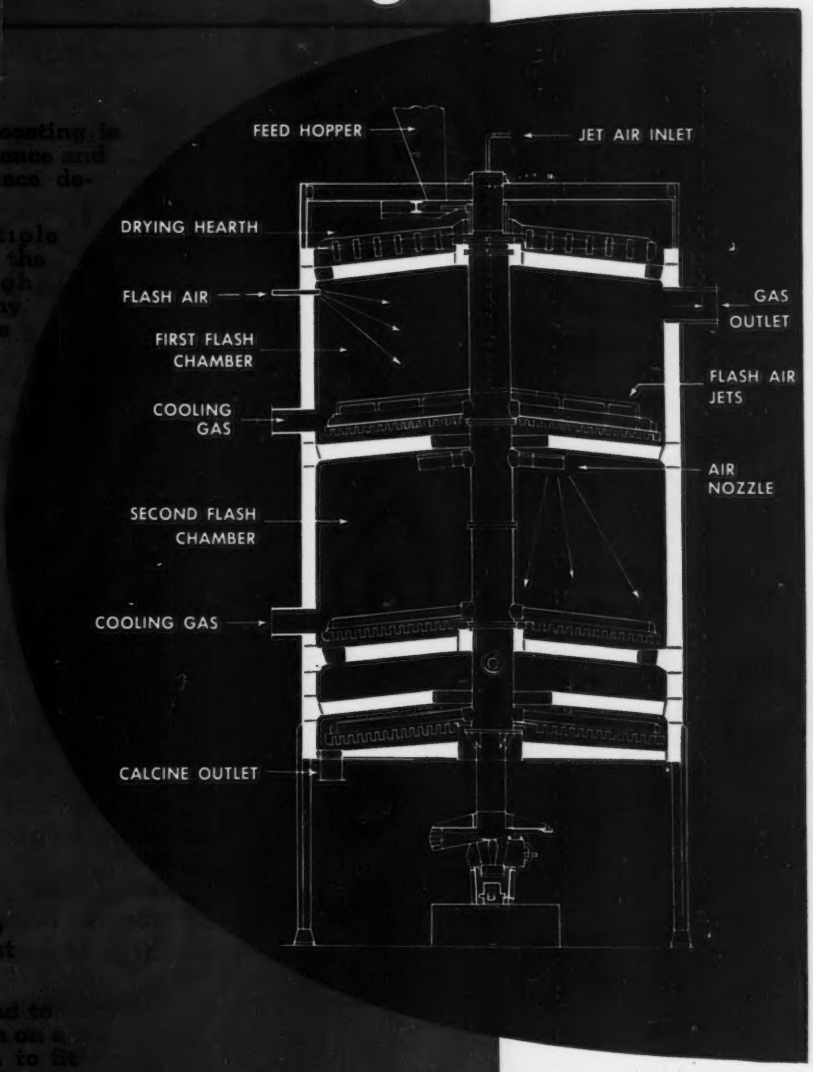
Efficient, effective process roasting is the result of research, experience and knowledge—applied to furnace design.

Nichols Herreshoff Multiple Hearth Roasters incorporate the know-how gained through world-wide application in many industries. Flexibility of the basic Nichols design is illustrated by the adaptation shown at the right, designed for large tonnage capacity and high sulphur gas product.

High tonnage rate

Positive temperature control

Roaster gas rich in SO_2



This particular installation, a modified flash roaster design, makes roaster gases with 12% SO_2 content for a contact acid plant. The feed is pyrrhotite concentrate, roasted without pre-drying or grinding.

Nichols engineers will be glad to supply you with information on a multiple hearth adaptation to fit your specific requirements.

Please address all inquiries to:

NICHOLS Engineering & Research Corporation

70 PINE STREET, NEW YORK 5, N. Y.

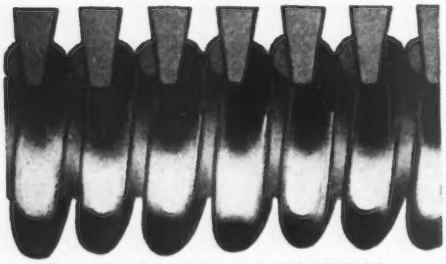
1637 N. Illinois St., Indianapolis 2, Ind. . . 40 S. Los Robles Ave., Pasadena 1, California

1477 Sherbrooke St. W., Montreal 25, Canada

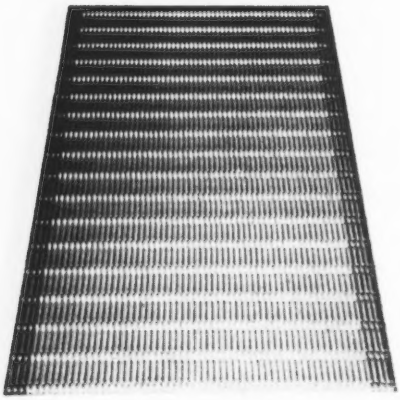
Wedge-Wire Kleenslot

REG. U. S. PAT. OFF.

The diagram above illustrates clearly and concisely the non-clogging and non-blinding advantages of Wedge-Wire preparation screens. All materials "clear" quickly, thus increasing efficiency in production.



The wedge shaped wires permit KLEENSLOT screens to clear rapidly and increase material output.



PREPARATION, SIZING and DEWATERING SCREENS *for* THE MINING FIELD

DESIGNED and PRODUCED TO YOUR SPECIFICATIONS

Wedge-Wire KLEENSLOT preparation screens were developed to provide high production at lowest cost per ton. We offer to the mining industry which has screening, dewatering, washing, drying, filtering or sizing problems, a high standard of efficiency and performance. In short, we offer efficient precision applications, coupled with long life. Greater design strength is obtained in even the smallest size by rigid cross-rods which tie the wires together, eliminating distortions of openings and giving maximum strength and support.

Only quality materials are used, including mild steel, stainless steel, bronze, brass, monel, copper, nickel, aluminum and silicon bronze.

All Wedge-Wire screens are manufactured to your specifications and be assured that our engineering staff will capably assist you promptly in obtaining the proper and correct solution to your preparation problems.

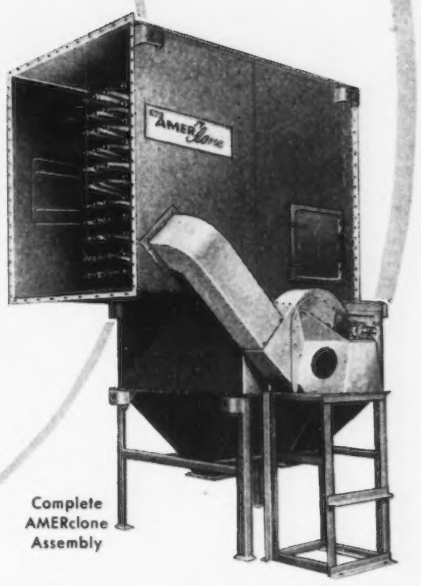
KLEENSLOT screens are made to fit any type of machine or installation. They may be curved to any shape or form, drums, troughs, etc.

Wedge-Wire CORPORATION

GAS ST. at NICKEL PLATE R.R. • WELLINGTON, OHIO

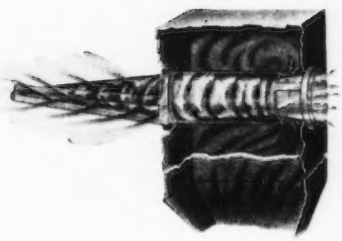
ANNOUNCING THE *NEW* AMERClone

AAF INTRODUCES NEW "TWIST" IN DRY CENTRIFUGAL DESIGN



Complete AMERclone Assembly

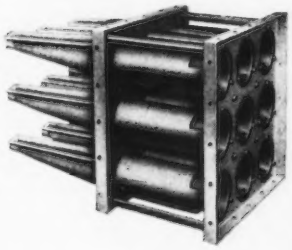
AMERClone Tube



Here's the new "twist" in dry centrifugal design! Only 4" in diameter, the Type G AMERclone tube has an approach velocity of 1000 fpm and a capacity of 333 cfm. Note how clean air travels out through end of tube without changing direction while 10% of air plus collected dust is bled off and thrown into primary dust hopper.

AMERClone Cell

Nine AMERclone tubes are combined to form a single AMERclone cell having a face area of only 20" x 20" and a nominal rating of 3000 cfm. Any number of cells can be used to achieve the desired capacity and they may be assembled to form a unit of a height and width which conform to your space limitations.



AMERclone—another product of AAF research—is designed to handle large exhaust volumes containing dry, granular dust in high concentrations. It introduces many features new to dry centrifugal design which result in the following advantages—

High Collection Efficiency

AMERclone's efficiency is comparable to or better than that of other high efficiency dry-type centrifugal.

Requires Less Space

High approach velocity and single-direction air flow of the AMERclone tube reduces space requirements to as little as one-half that of collector using the conventional reverse air flow principle.

Less Subject to Abrasion

Cast iron tube construction plus elimination of dust re-entrainment assures long life under heavy abrasive service.

Maintains Efficiency

Regardless of variation in primary air volume, AMERclone's maintained secondary air circuit compensates for variation in available centrifugal forces—assures constant collection efficiency over wide operating range.

Write today for Bulletin No. 291 containing complete technical data on the new AMERclone.

See the new AMERclone, Cycoil Oil Bath Air Cleaner and other wet and dry type AAF dust collectors at Mining Congress exhibit, San Francisco, Sept. 20-23.

AAF

American Air Filter

COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 193 Central Avenue, Louisville 8, Kentucky

Western DUMP CARS CAN CUT YOUR COSTS 3 WAYS

Western ***dump cars can save you money three ways:***

1. **FASTER AND EASIER** dumping and righting, because of their speedy action and dual side pivots, enable Westerns to cut operating costs by making those extra trips every day.

2. **EXTRA PAYLOAD** on every trip is the result of Westerns' design and the fact that they are of light but strong alloy steel. Deadweight is reduced to an absolute minimum.

3. **LESS MAINTENANCE, LONGER LIFE** are the inevitable result of their being designed and built so ruggedly . . . bed underframe is welded into a single strong unit . . . sturdy mechanism is always dependable . . . double plate doors are reinforced for unusual strength where needed most.

These are three of the reasons why more and more companies are cutting their haulage costs by replacing obsolete dump cars with modern Westerns. For further facts, write Department 6808, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

Western ***. . . Built by the world's largest manufacturer of dump cars***

BALDWIN - LIMA - HAMILTON

Philadelphia 42, Pa. • Offices in Principal Cities

Bessemer

operation proves that Hazacords can take punishment

All the units in this operation are "big bruisers", selected for ability to operate on a big scale under the most difficult conditions. At this Bessemer Limestone and Cement Company limestone quarry the five-cubic-yard dippers can load at the rate of 400 tons per hour. The blasting, rock dust and rough ground mean that only top quality materials can keep all operating equipment from trucks to electrical cables continually on the job.

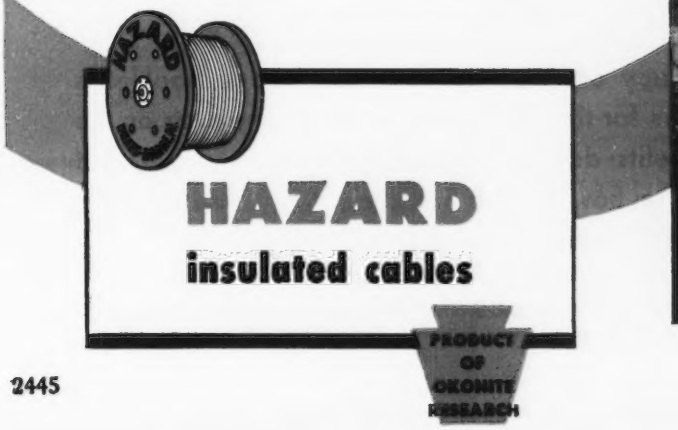
Operating at 4160 volts, the Hazacord Type SH-C, 5-kv portable cables have proved themselves able to withstand the worst treatment this operation can provide. The extremely durable Hazaprene ZBF sheath is excellent protection against the constant scraping, twisting and dragging that is normal in this type of operation. Hazard Keystone rubber insulation and shielded construction provide long electrical life and maximum protection for personnel when handling the cables.

No matter what the type of installation, there is a Hazard cable that will handle power distribution up to 15,000 volts. Ask your Hazard representative or write Hazard Insulated Wire Works, Division of The Okonite Company, Passaic, New Jersey.

Men can carry shielded Hazacord high voltage cables with complete safety from electrical discharges.

Hazacords are known for their reliability in blasting operations such as this where there is constant threat from impact and sharp uneven surfaces.

Hazacords give long service even when dragged continuously over rough, destructive terrain like that shown here.



2445

All business is specialized

. . . and nothing specializes on your business like your business paper

You can sell suntan lotion on Broadway or Beacon Street, but this seagoing salesman can sell a whale of a lot more . . . because he *specializes.*

Your business is specialized, too. That's why it pays to keep up with your business paper. It specializes on business problems you meet every day. It helps you do a whale of a lot better job by keeping you posted on your whole field. You can *move ahead* when you know what's ahead; you can make quicker, surer decisions when you have a clear perspective on what's happening; and you get all this from your business paper.

Every page counts. The editors gather facts, weigh and interpret them. The advertisers line up new products, materials and equipment . . . tell you what they do and where to buy them. To know what's new that's important to you, read *every* issue—thoroughly! It will keep you one of the best informed people in your field.

This business paper in your hand has a plus for you, because it's a member of the Associated Business Publications. It's a paid circulation paper that must earn its readership by its quality . . . And it's one of a leadership group of business papers that work together to add new values, new usefulness, new ways to make the time you give to your business paper still more profitable time.

A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet." Room 2710.

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd St., New York 36, N. Y.

One of a series of advertisements prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

"DO IT YOURSELF" MAINTENANCE TIPS
from the GOULD Plus-Performance Plan

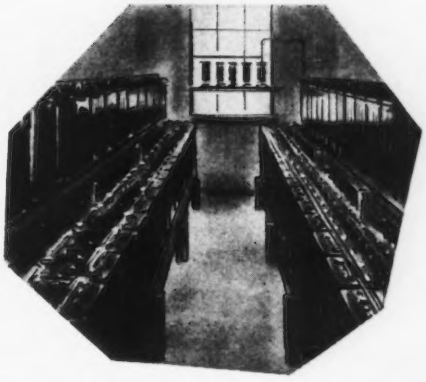
"AN EASY WAY TO CUT BATTERY-POWER COSTS"

HERE'S MONEY-SAVING MAINTENANCE TIP #1

BEST WAY TO INSTALL GLASS JAR CELLS ▸

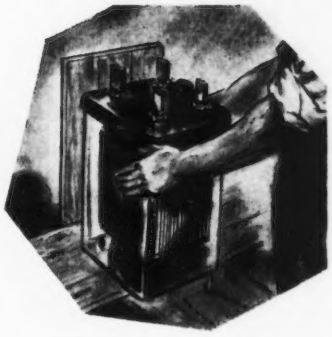
1. *Locating Battery Rack* ▸

Rack should be so located that all cells are accessible. Rack must be level, coated with acid-resistant paint and insulated from floor. If more than one rack is used they should be insulated from each other.



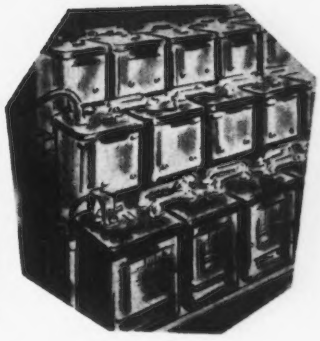
2. *Uncrating* ▸

Remove top and sides of boxes in which cells are shipped. Slide cells or trays out of boxes. Do not lift by terminals. Lift by supporting from beneath.



3. *Installing* ▸

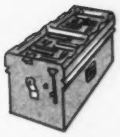
Place *all* cells on rack before making connections. Clean all contact surfaces and coat with vaseline. Start in center of a row and attach connectors, lining up cells in a straight line. Check for polarity and over-all voltage with voltmeter.

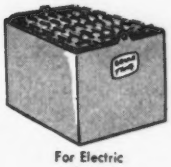


GOULD Batteries

GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

For Railroad Air Conditioning and Lighting


For Mine Shuttle Cars and Locomotives


For Electric Industrial Trucks

For Diesel Locomotive Starting

For Standby and Emergency Power

©1954 Gould-National Batteries, Inc.

Always Use Gould-National Automobile and Truck Batteries

This is only one example of the many helpful service tips contained in the Gould Plus-Performance Plan. For the complete set of published information on battery service and maintenance mail the coupon TODAY.

BATTERY INFORMATION HEADQUARTERS
Dept. EM-94 Trenton 7, N. J.

Please send me, without charge or obligation, the Gould Plus-Performance Plan for _____ batteries.
(type or types)

Name _____

Firm _____

Address _____

City _____ Zone _____ State _____

Visit our booth #146 at the Mining Congress Show find out about SPIRATUBE®-M and AYRTUBE® the flexible mine ducting

Flexible Tubing CORPORATION

Guilford, Connecticut Pasadena 1, California

One man can easily carry 75 feet of Spiratube-M with handy Spiratote carriers.

Spiratube-M is specially designed to bring air to the working face. It's wire reinforced fabric, that's built to take tough mine usage. Its design provides rapid coupling and uncoupling . . . unimpeded airflow around bends . . . easy carrying and storage.

Ayrtube is a heavy-duty pressure tube without wire frame. Can be collapsed to avoid concussion damage. Impervious to abrasion, water and chemical corrosion. Installs rapidly. Economical for straightway ventilation — interchangeable with Spiratube-M where bends and turns are encountered.

20 h.p. Sheppard DIESEL

Simplified Fuel Injection System

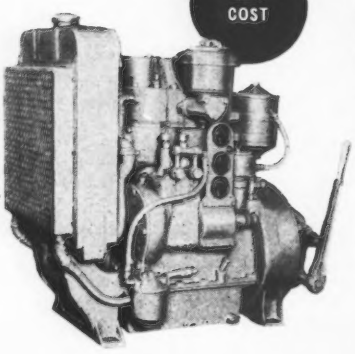
22 to 1 Compression Ratio

LOW COST

for heavy-duty mine service

Available with torque converter or clutch

THE MODEL 17, in the size, weight and price range of comparable gasoline power, offers the added advantages of diesel safety and economy. Optional hydraulic starting, along with compression ignition, eliminates spark hazard. Free folder gives complete details.



LOOK for Sheppard Diesel Model 17 in Machinery at the Mining Show.

SHEPPARD DIESELS
HANOVER 3, PA.

For EXCEPTIONAL Performance

DFC *specify* **ELECTRIC ASSAY FURNACES**

Positive, constant control of temperature not possible with any other fuel — automatic or manual controls as preferred.

Positive control of atmospheric conditions for cupelling—both temperature and ventilation under push-button control.

- Economical to operate.
- Clean, Noiseless. Maximum operator comfort. No muffles required.

WRITE FOR BULLETIN

DFC
The DENVER FIRE CLAY Company
2301 BLAKE STREET • DENVER, COLORADO
SALT LAKE CITY • EL PASO • ALBUQUERQUE

HERCULES®

Pine Oil

FOR MAXIMUM RECOVERY

Hercules Yarmor® F Pine Oil has been a standard of quality among flotation frothers for over thirty years. It is still unequalled for its economy, for its strength and volume of froth, texture, and cell-life stability.

This low-cost flotation agent is an excellent frother for sulfide minerals such as the zinc, copper, nickel, iron, and lead sulfides. It is widely used in the flotation of gold ores and native metals. Yarmor F is also an excellent frother for use in the beneficiation of nonsulfide ores such as coal, mica, quartz, graphite, feldspar, phosphate rock, and talc.

For technical information on Yarmor F and other Hercules flotation aids, send for 16-page booklet, "Flotation and Hercules Flotation Agents."

Naval Stores Department

HERCULES POWDER COMPANY

INCORPORATED

933 King Street, Wilmington 99, Delaware

NM53-1

STRAUB

HAS RIB-CONE MILLS FOR ALL GRINDING OPERATIONS

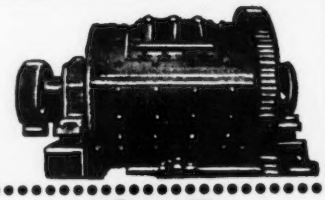
More than 100 sizes and types of ball mills. 40 years of experience in supplying every conceivable grinding requirement is at your disposal in the form of engineering counsel. *An inquiry to our engineering department will bring a prompt reply.*

STRAUB MFG. CO.

8383 BALDWIN STREET • OAKLAND 21, CALIF.

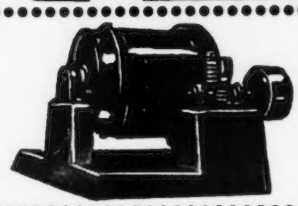
SECTIONALIZED MILL

Completely assembled in our shop, then marked and knocked down for shipping "Anywhere a Mule Can Go."



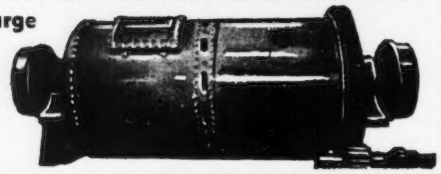
SCREENING MILL

Most economical type. Particularly suited to amalgamating and concentrating classes of ores. Capacity from 2 to 95 tons per 24 hours.



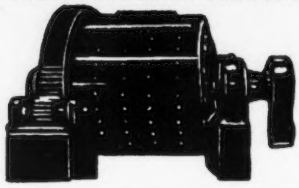
Peripheral Discharge MILL

Particularly suitable for producing a granular product. Designed for controlled grinding of tungsten and similar ores where sliming must be eliminated.



LOW PULP LINE MILL

One of the new Champion Series. Available in low pulp line, plain overflow, screening and convertible types with capacities ranging from 25 to 250 tons per 24 hours.

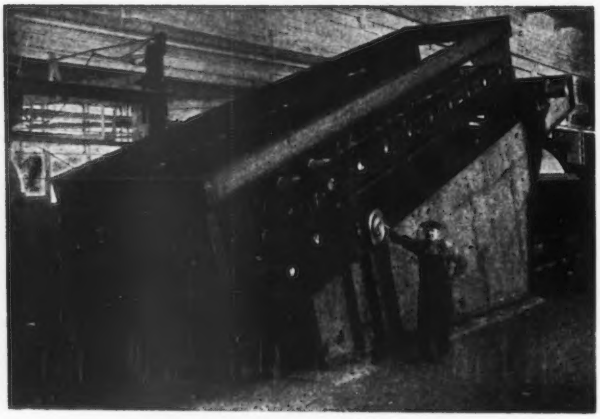


More than 100 Sizes and Types of RIB-CONE Ball Mills

ROSS FEEDERS

FOR HANDLING ROCK, ORES, ETC.

ROSS CHAIN FEEDERS



ROSS DROP-BAR GRIZZLY FEEDERS

Ross Drop-Bar Grizzly Feeder to Handle Rock to a 42" x 60" Jaw Crusher

ROSS SCREEN & FEEDER CO.
100 Quimby Street
Westfield, N. J., U. S. A.

ROSS ENGINEERS, LTD.
11 Walpole Road
Surbiton, Surrey, England

CANADIAN LICENSEE: E. LONG LTD., ORILLIA, ONTARIO

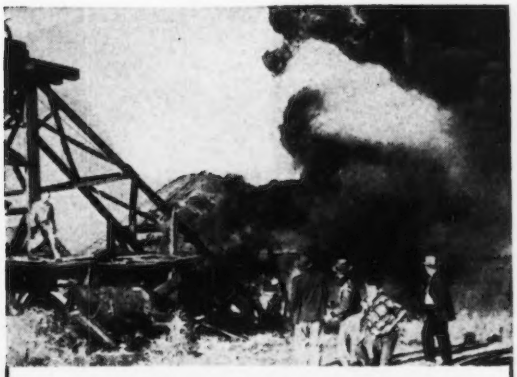
*Note extremely rugged conditions in this photo, showing bottom loading conveyor system in British coal mine. Inset shows roll of SCANDURA.

For **FIRE SAFETY,** Long Life and Economy —

NEW **SCANDURA**

The original P. V. C. coated conveyor **BELTING**

You want *extraordinary resistance* to wear and tear with top tonnage hauls—and you get it with SCANDURA. But even more, you want *fireproof conveyor belting* that eliminates one of the great hazards of mining—fire caused by friction when your conveyor belt slips or stalls.



LET'S LOOK AT THE RECORD!

About 12% of coal mining fires in the past several years have been attributed to conveyor-belt friction.

At the 1953 annual meeting of the Illinois Mining Institute, data was presented to show that the majority of belt fires result from stalled belts while the driving pulley continues pulling.

In the tragic Evanston, Ky. fire in which 4 men lost their lives, fire was reported to have had its origin in the friction caused when a fall stopped the belt, while the drive motor continued to operate.

This record clearly points to the great need for SCANDURA BELTING!

SCANDURA, developed by our parent company, and now being manufactured in our Charlotte, N. C. plant, has these unique features:

- *Withstands abrasions that would ruin other belts.*
- *Exceptionally tenacious in holding fasteners.*
- *Solid woven base with covers that will not strip, gouge or "dog ear".*
- *Not affected by water, dilute acids, alkalis, salt solutions, etc.*
- *Non-inflammable, mildew and rot-proof.*
- *Works in temperatures ranging from 22° below to 212° above.*
- *Can be made in widths from 1" to 42" and thicknesses from ⅛" to ⅜".*

SCANDURA has been tested and used with gratifying results in Britain since 1946. For safety and economy, it's in a class by itself. Write, wire or telephone for complete data.

SCANDINAVIA BELTING COMPANY
250 CENTRAL AVENUE, NEWARK 1, N. J.
BOSTON • PLANT: CHARLOTTE 1, N. C. • CLEVELAND

Made Tougher to Last Longer—

CHESTER plasticord-plasticote® WIRES & CABLES

CHESTER SHOT FIRING CABLE

- Resists sharp edges and abrasion
- Flame retarding, waterproof
- Non-Decaying, non-aging
- High strength, extra flexibility
- Non-cracking from —40°C to +80°C
- Resists most alkalies, acids, oils, greases
- Immune to ozone and sunlight

Nylon jacket over center core makes this Chester Cable super-durable. Withstands sunlight and ozone, dragging over abrasions and sharp edges and extremes of temperature will not crack it. This cable is highly flexible, completely waterproof . . . lasts for years in mine service. For complete specifications and samples of Chester wire for mine service, write today.

MINE-SERVICE TELEPHONE WIRE
Flame-retarding, non-decaying and waterproof. Resists acids, extreme temperatures and offers high tensile strength.

NEW IMPROVED BLASTING WIRE
Waterproof construction with high mechanical strength. Covering is flame retarding. Extra dependable.

"Chesty" says—KEEP YOUR POWDER DRY AND FIRE IT WITH CHESTER!

CHESTER CABLE CORP.
CHESTER, NEW YORK

A LITTLE BIGGER
A LITTLE WIDER
AND A LOT BETTER

THE BOOTH FLOTATION CELL

MAKES DIVIDENDS
A LITTLE MORE SECURE

ONE INSTALLATION REPORTS
NO VISIBLE SIGNS OF WEAR
AFTER 285,000 TONS OF FEED

COMPLETE ORE TESTING FACILITIES
— SHIP US YOUR PROBLEMS —
EXPERIENCE COVERS ORES FROM EVERY
IMPORTANT MINING DISTRICT IN THE WORLD

the **BOOTH** *company*
Incorporated
333 West 14th South St., Salt Lake City 4, Utah

MINERALS SEPARATION • MANUFACTURE • EQUIPMENT

A tip for top performance

TeeCee
TUNGSTEN CARBIDE

&

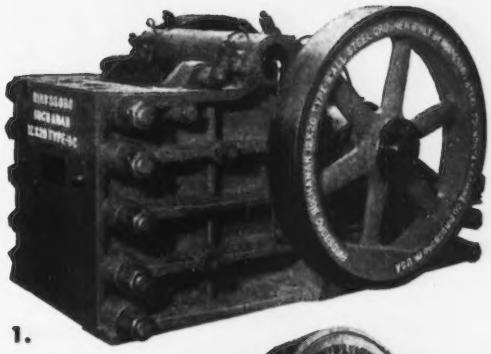
"TYPE L"
ONE PASS STEEL

LIDDICOAT

DETACHABLE
DRILL BITS

MANUFACTURED BY
Thompson Products
THOMPSON PRODUCTS LTD. • ST. CATHARINES, ONT.

For Your Tough Crushing Assignments— For Greater Tonnages at Lower Cost—

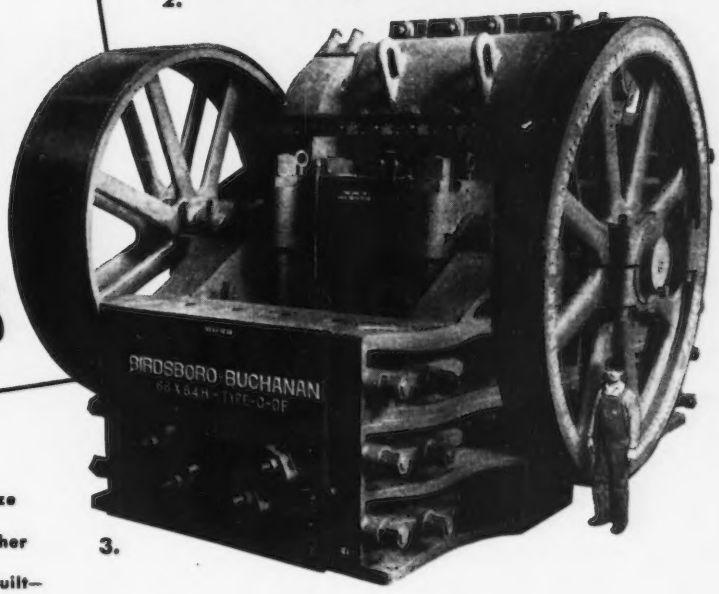


1.

2.

THE NAME IS

BIRDSBORO BUCHANAN JAW CRUSHERS



3.

1. **Small—but the strongest crusher of its size —12" x 20".**
2. **Birdsboro-Buchanan Deep Frame Jaw Crusher —Size 48" x 60".**
3. **Largest Deep Frame Crusher ever built— Size 66" x 84".**

BIRDSBORO

BIRDSBORO STEEL FOUNDRY & MACHINE CO., BIRDSBORO, PENNA.

BIRDSBORO BUCHANAN JAW CRUSHERS

Offices in Birdsboro, Pa. and Pittsburgh, Pa.

designers and builders of: Crushing Machinery • Hydraulic Presses • Steel Mill Machinery • Rolls • Special Machinery • Steel Castings

Vitro Corporation of America is an industrial organization with five well-established operating divisions. One of these, Vitro Uranium Company, is a major processor of uranium ores which it buys from independent mines throughout the western United States.

Using the most advanced refining methods — many of them the product of its own research efforts — Vitro's Salt Lake City mill consistently produces high quality uranium salts from varying grades of ore.

Vitro's other divisions also contribute to the nuclear field. Like Vitro Uranium, they regularly devise new technological advantages for both industry and government.

Vitro Rare Metals Company refines and recovers rare metals and processes uranium materials.

Vitro Laboratories conducts chemical and physical research and develops processes and systems.

Vitro Engineering Division designs and engineers processing and technical facilities.

Vitro Manufacturing Company makes chemical products and ceramic colors.

Your inquiry bearing on these, or any related fields, will receive prompt attention.

Vitro URANIUM COMPANY

600 West 33rd South Street, Salt Lake City 15, Utah

DURIA HARD METAL

for Mining Tools
Cutting Tools
Drawing Die Industry
Wear Resistant Parts

The extraordinary fine and uniform grain structure of our Hard Metals guarantees longer tool life and high wear resistance.

DURIA-WERK KARL KEMPF
NEUSS/RH. (GERMANY)

designers and builders of equipment for basic industries

IMMEDIATE DELIVERY

Centrifugal Pumps

McNally Pittsburg centrifugal pumps are built specifically to reduce the cost of handling corrosive slurries.

Available in a wide range of sizes in complete systems or single units, these pumps reduce the cost of maintenance because the parts that take the punishment are made of special Ni-Hard alloy iron in McNally Pittsburg's own foundry.

For Basic Industries McNally Pittsburg offers:

* SERVICES *

Engineering Design Field Erection
Research & Development

* EQUIPMENT *

Conveyors
Crushers
Dryers, Centrifugal and heat.
Washers, heavy media and jig
Kilns
Pug Mills
Screens
Pumps, Valves, Piping
Car Hauls, Dumpers

Mc NALLY PITTSBURG
MANUFACTURING CORPORATION

* OFFICES *

Pittsburgh, Pa.
First National Bank Bldg.

Chicago, Illinois
307 N. Michigan

* PLANTS *

Pittsburg, Kansas

Wellston, Ohio

Now you can use GROOVED END COUPLINGS with . . .

LUNKENHEIMER Grooved End Valves

YOU can combine famous Lunkenheimer Valve quality with the speed and convenience of grooved end couplings.

Grooved end valves are rapidly becoming more popular in many fields, including Mining, Petroleum, Waterworks, Sewage Disposal, Refineries, Industry, Construction, and Marine service. They permit pipelines to be laid over uneven ground, and their flexibility allows deflection of several degrees. Connections are made quickly and easily.

You can enjoy all these advantages — plus really outstanding valve performance — when you use Lunkenheimer Grooved End Valves. They are available in 200 lb. Iron Body Bronze Mounted patterns, with either rising or non-rising stems. They incorporate the same world-famous features as regular Lunkenheimer I.B.B.M. Valves. Only the end flanges are changed to accommodate grooved end couplings.

For more information on Iron Body Gate Valves, see pages 154-159 of your complete-line Lunkenheimer Catalog 53, or call your Lunkenheimer Distributor. The Lunkenheimer Co., Box 360, Cincinnati 14, Ohio.

Fig. 1431
Grooved End Gate Valve
Rising Stem
Iron Body Bronze Mounted
2½ to 8 inch sizes
200 lb. W.O.G.
Fig. 1686
2 inch size
225 lb. W.O.G.

The cost of a Lunkenheimer Valve gets smaller and smaller and smaller with each passing year of dependable service.

LUNKENHEIMER
QUALITY

IRON • STEEL • BRONZE

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

L-454-6

Let's face it!

HAVE YOU A DISASTER PLAN FOR YOUR PLANT?

BOMBS...OR FIRE...OR FLOOD...OR TORNADO ...you can handle them if you act now.

Let's face it... the threat of war and the atomic bomb has become a real part of our life—and will be with us for years. Fires, tornadoes and other disasters, too, can strike without warning.

Whatever the emergency is, everybody's going to want help at the same time. It may be hours before outside help reaches you. The best chance of survival for you and your workers—and the fastest way to get back into production—is to know what to do and be ready to do it. Disaster may happen TOMORROW. Take these simple precautions TODAY:

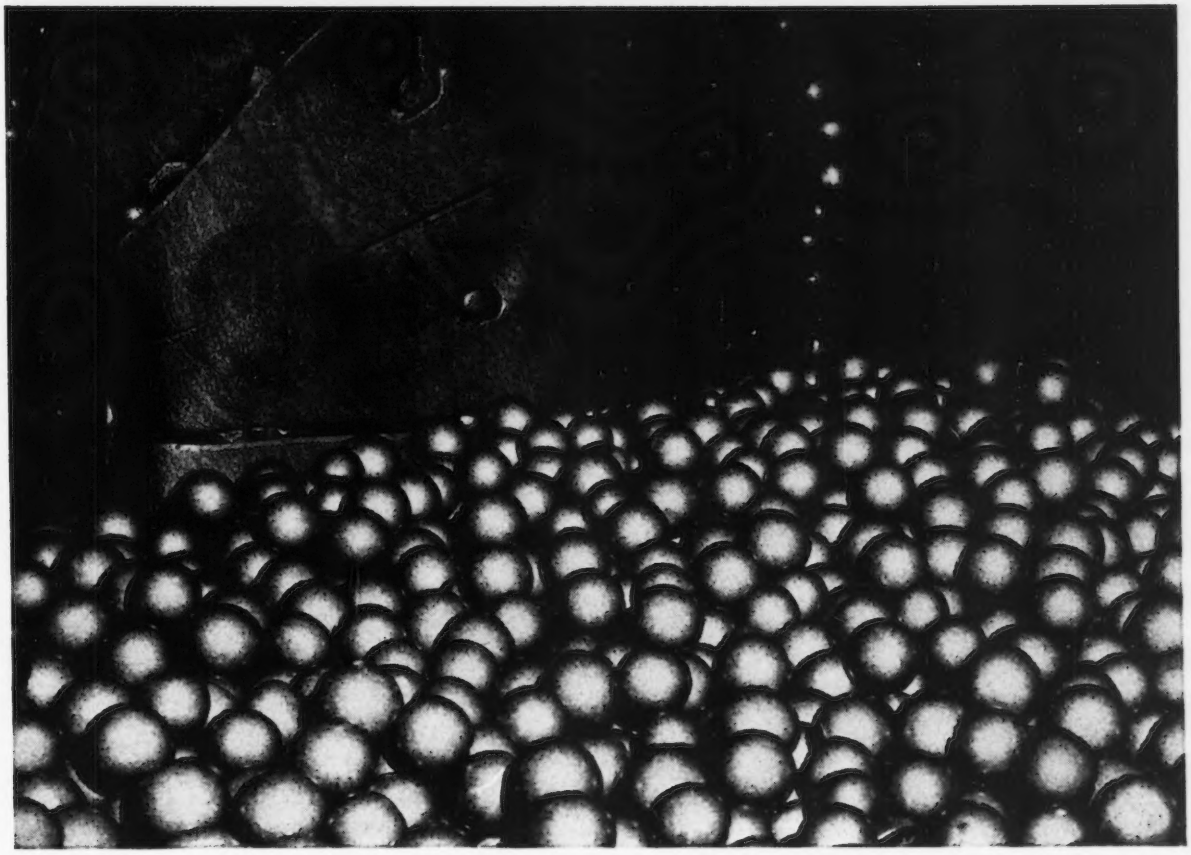
☐ **Call your local** Civil Defense Director. He'll help you set up a plan for your offices and plant—a plan that's safer, because it's integrated with community Civil Defense action.

☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here, again, your CD Director can help. He'll advise you on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First-Aid Training Courses. They may save your life.

☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads and official CD films or literature that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good community relations—and no greater way of helping America.

Act now . . . check off these four simple points . . . before it's too late.



You Can Cut Costs Here

SHEFFIELD
ARMCO
MOLY-COP
TRADE MARK
COPPER · MOLYBDENUM · ALLOY
GRINDING BALLS

Sheffield copper molybdenum alloy steel grinding balls are manufactured by automatically controlled methods which produce a ball of finer, denser, more uniform structure.

Moly-Cop balls wear evenly and retain their spherical shape longer. They have greater hardness for wear and toughness to resist spalling and chipping. This all adds up to high production rates with less down time, less charging and less power.

Moly-Cop grinding balls can make an important net saving in your grinding cost.

If you have not already proven the value of Moly-Cop balls, get in touch with us before making your next purchase.

SHEFFIELD STEEL
DIVISION
ARMCO STEEL CORPORATION
SHEFFIELD PLANTS: HOUSTON KANSAS CITY TULSA

EXPORT REPRESENTATIVES: **ARMCO INTERNATIONAL CORPORATION** · Middletown, Ohio

CHECK 'EM OFF

THE INSIDE REASONS FOR MACK'S STAND-OUT $$$ EARNING POWER

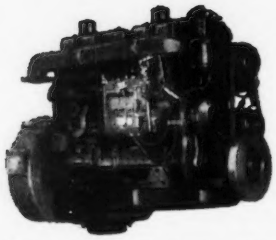
Keeping going under conditions that stop other trucks cold—carrying big payloads . . . on fast schedules . . . in the roughest operations—that's what points up the ability of Mack trucks to build greater profits for you.

WHEREVER YOU SEE A TOUGH JOB...
THERE IS WHERE YOU SEE MACKS

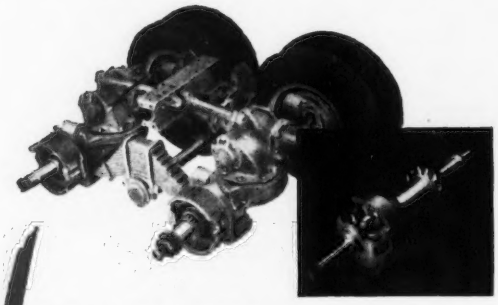
Mack TRUCKS

Mack Trucks, Empire State Building, New York 1, N.Y. Factory Branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

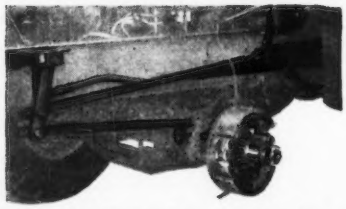
2277



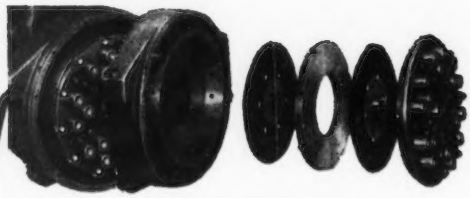
Plentiful Horsepower. Mack provides the right powerplant, gasoline or diesel, to haul most efficiently, most profitably for each specific operation. Complete range of engine options up to 400 horsepower. Coupled with the most rugged transmission or torque converters yet developed.



Balanced Bogie With Power-Divider. Only Mack six-wheelers offer the unique advantage of Mack's Balanced Bogie, incorporating the exclusive Power-Divider. With the Mack Power-Divider torque is distributed between bogie axles in proportion to traction, thus enabling Macks to pull through where other trucks mire in.



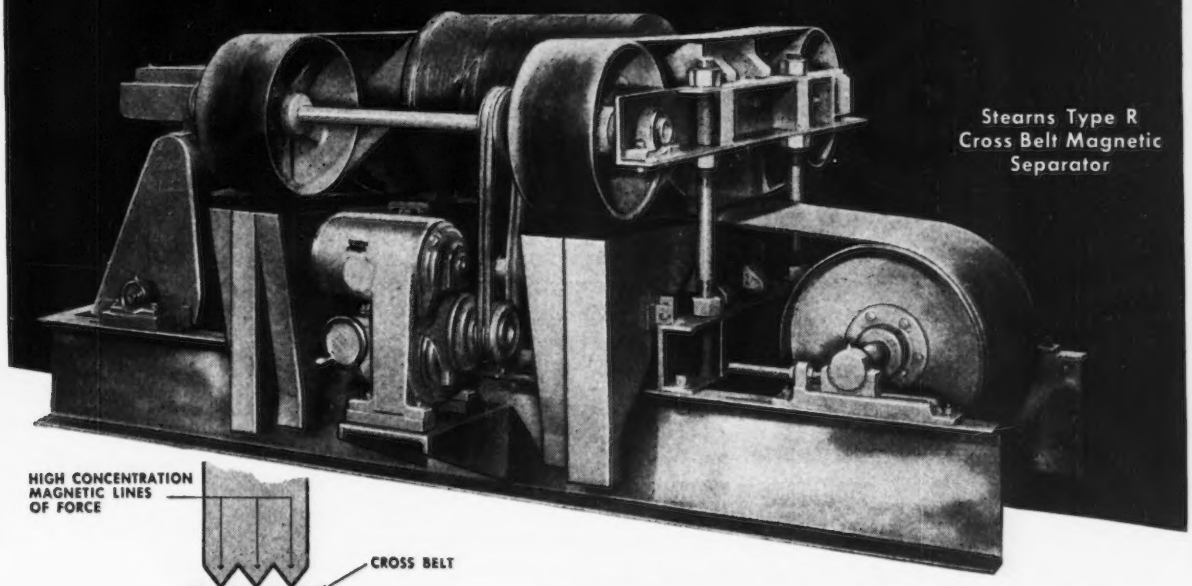
Power-Steering. Hydraulic power-steering permits effortless, fast steering and positive, shockless control.



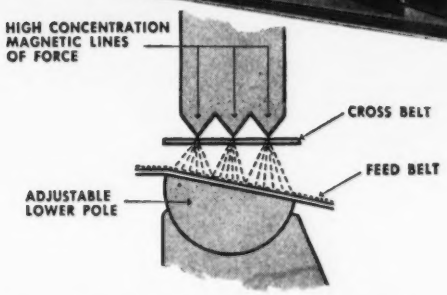
Air-Assist Clutch. Operation of the big, double-plate clutch is virtually effortless, reduces driver fatigue.

Hydraulic Turbo-Braking Systems and powerful air-actuated brakes provide utmost safety for downhill going, assure safe and positive driver control at all times.

Stearns makes two magnets do the work of five in strategic ore separation



Stearns Type R
Cross Belt Magnetic
Separator



Exclusive variable pitch lower pole. Simply by varying the pitch of the lower pole piece you can vary the air gap between the upper and lower poles to increase or decrease strength of magnetic lines of force at each point. This enables very selective extraction of distinct magnetic products at each point. The most magnetically responsive ore will be separated at the first or wide gap point. As the air gaps get smaller the magnetically weaker ores are extracted and carried off on the bottom side of the cross belt. Non-magnetic material is carried off on the feed belt.

With this variable pitch lower pole, as many as one non-magnetic and ten magnetic products can be obtained from just two magnets. *To do this same job on ordinary separators would require five magnets, take up much more floor space and cost approximately twice as much.*

Equipped with exclusive, patented variable pitch lower pole, the Stearns cross-belt magnetic separator does more work, faster and at lower cost than comparable units of greater size. It provides amazing control in separating weakly magnetic ores in both placer and hard rock deposits — monazite, wolframite, huebnerite, ferberite, columbite, tantalite and ilmenite. Other special features include:

1. Individual, independent variable speed drives for both cross belts and feed belt . . . an exclusive Stearns feature.
2. Separator is furnished with an electric control panel with rheostat and ammeter to adjust strength of magnet.
3. Design of unit permits closed magnetic circuit — magnetic intensity is utilized at exactly the desired points.
4. All points in each magnetic field are of the same polarity. This, plus the fact that the mineral grain is entering successive points of increasing magnetic intensity, because of the adjustable lower pole, helps to overcome magnetic reluctance in weakly responsive materials.

Stearns maintains a fully equipped laboratory for thoroughly analyzing and testing ore samples. This, plus Stearns' wide experience in the magnetic separation field, assures you of getting exactly the right unit for your needs. Ore samples for analysis or requests for information receive immediate attention. Write today.

1073

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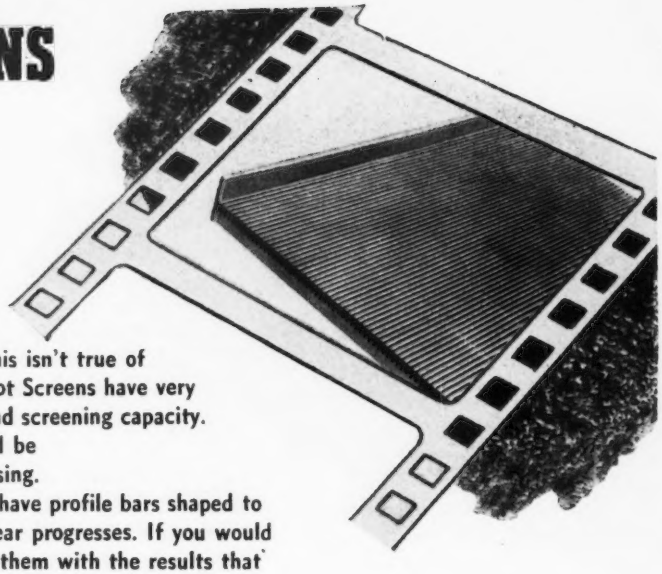

One sure way of testing the dewatering qualities of a screen is to run water over it. Nine times out of ten you'll find the screens with the best dewatering qualities have openings too large for profitable material retention. But this isn't true of Hendrick Wedge-Slot Screens. For Wedge-Slot Screens have very small openings yet have far greater draining and screening capacity. And they retain material that ordinarily would be wasted or cause expensive delays for reprocessing.
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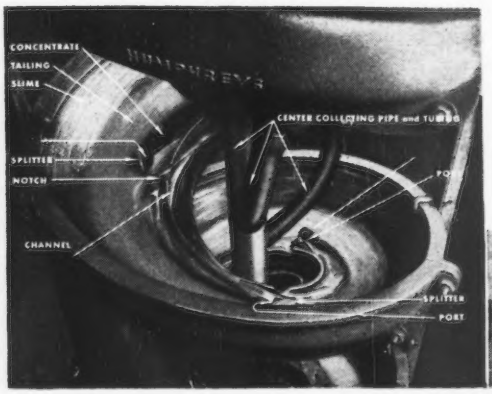

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THE HUMPHREYS INVESTMENT CO.
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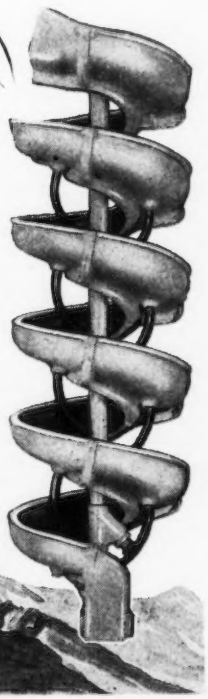
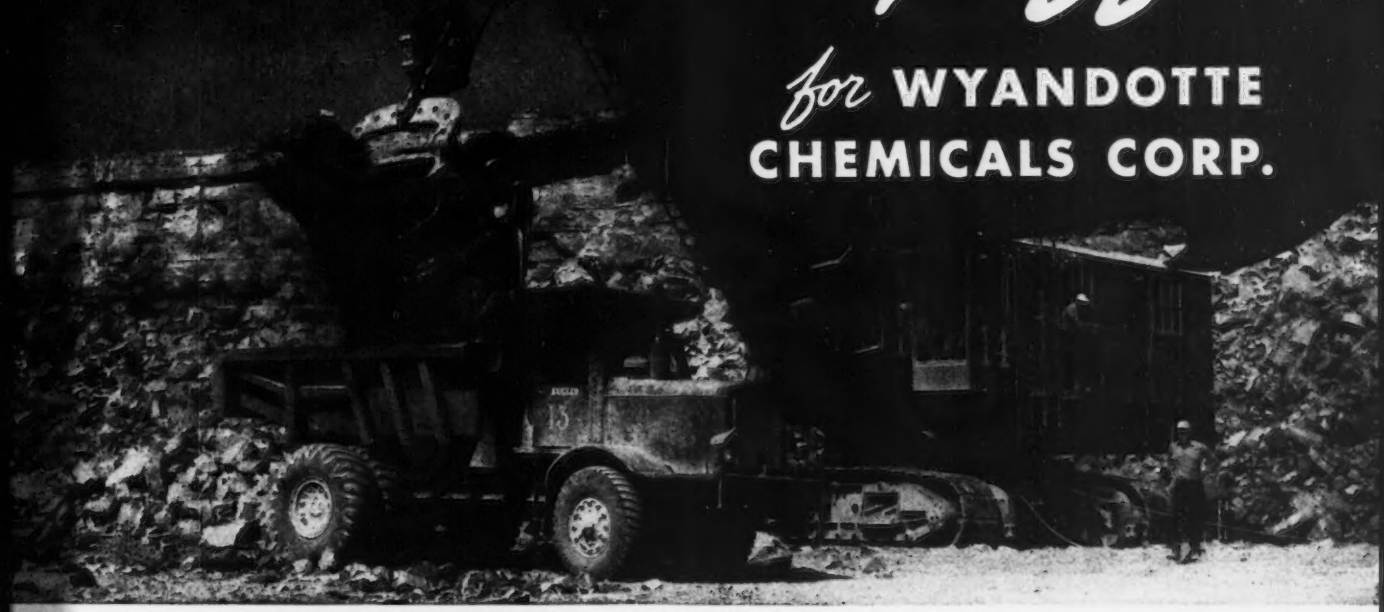
914 First National Bank Building • Denver 2, Colorado



"Eucs" Pay Off

for WYANDOTTE CHEMICALS CORP.



22,000 hours... still going strong!

At Alpena, Michigan, Wyandotte Chemicals Corp. operates one of the world's largest limestone quarries—another job where "Eucs" are paying off in more loads per hour at less operating and maintenance cost.

Seven years ago Rear-Dump Euclids of 22-ton capacity replaced an electric haulage system for moving rock from the quarry face to the plant. Loaded with stone by shovels of 5 and 6 cu. yd. capacity, and hauling overburden during the winter months, these fourteen "Eucs" have worked an average of 22,000 hours each. On a two mile round trip haul, each "Euc" delivers approximately 75 tons per hour for a total of more than 3 million ton-miles per unit.

Wyandotte standardized on Rear-Dump Euclids because of their job proved dependability on hundreds of mine and quarry operations. Performance records prove this decision has paid off because "Euc" speed, capacity and efficiency have increased production and lowered hauling costs at Alpena.

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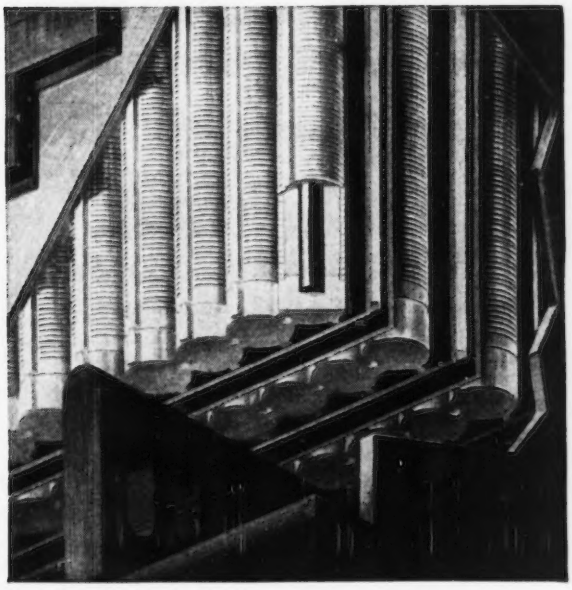
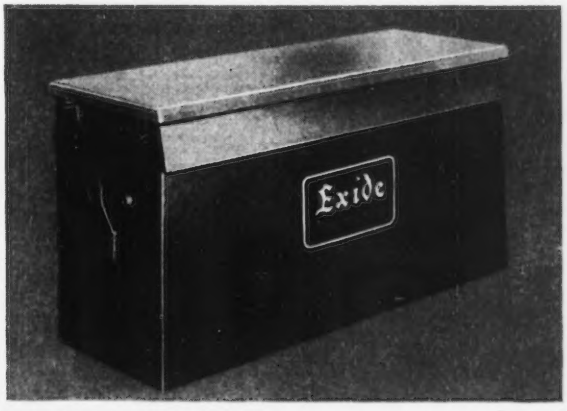


THE POSITIVE PLATES are the heart of any battery. Only Exide uses a slotted tube construction. By use of tubes, more active material is exposed to the electrolyte, providing *greater power.* Also, more active material is retained, giving *longer working life.*



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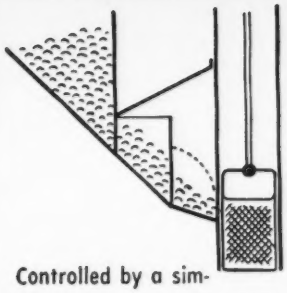

Controlled by a simple system of gates, actuated by descending and ascending skip and timed for full loads without time lag.

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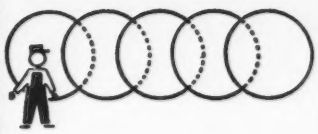

Purpose is to permit one operator instead of several for an entire battery of machines—without risk of a "pile up" if one unit goes out for any reason.

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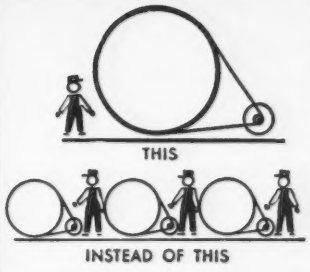

Permits higher output per operator, greater h.p. efficiency, less maintenance per ton of product.

While such techniques are not new, their application to any given set of requirements—to obtain closely co-ordinated flow, without "bottle necks" or excess capacity at any one point—calls for know how of the highest order. Stearns-Roger has a fund of experience in LOWERING COSTS in many industries. *Draw on that fund*—whether you need an entire new plant or additions and modifications of existing facilities.

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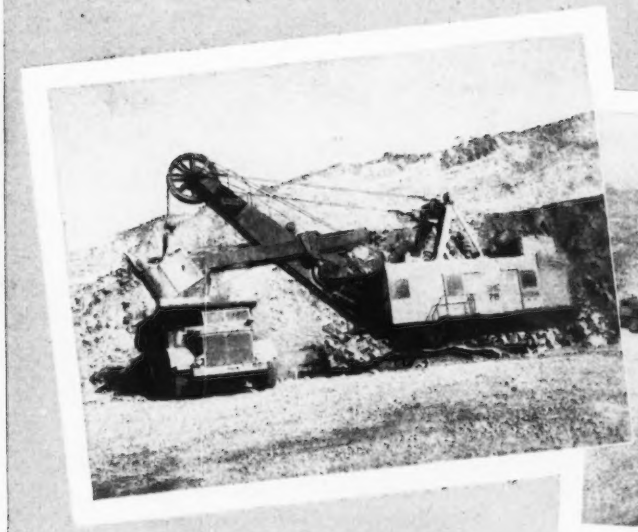

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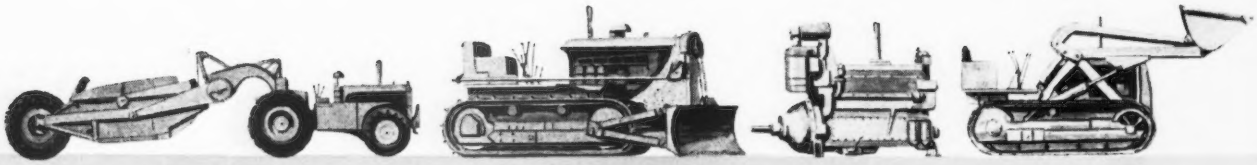

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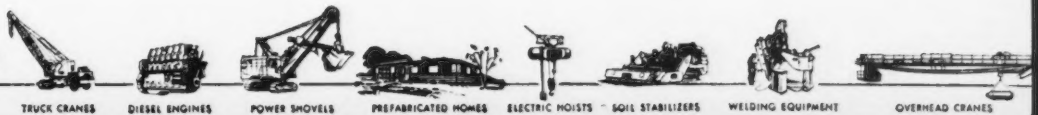

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